PROGRAM OUT COMES PROGRAM SPECIFIC OUTCOMES & COURSE OUT COMES

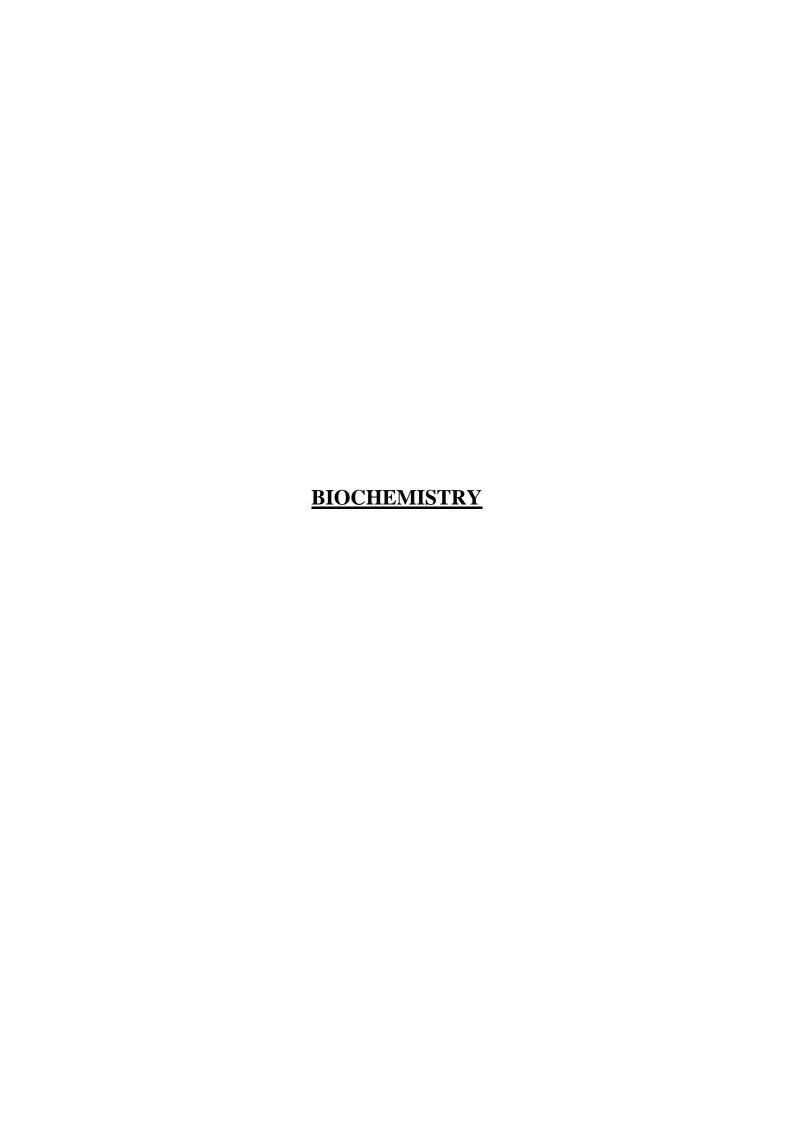
Program Outcome & Program Specific Outcome

2019-2020

Programmed Offered	Subjects	Type of course	Program Outcome	Program Specific Outcome
0110100	Economics + Geography+ Geology	Under	Prepare	Create, select
B.Sc.	Botany + Chemistry +Seed Technology	Graduate	students for	and apply
	Economics + Mathematics + Statistics		prominent career in	appropriate techniques,
	Computer Science + Geology + Mathematics		career in industry,	resources and
	Electronics+ Computer Science +	-	banks, offices	modern
	Mathematics		and for further	technology in
	Chemistry + Pharmaceutical Chemistry +		academic study	multi-
	Zoology			disciplinary environment
	Chemistry + Geology + Zoology			chvii oilineit
	Biochemistry + Chemistry + Zoology	-		
	Bioinformatics + Computer Science +			
	Zoology	_		
	Biotechnology + Botany + Chemistry			
	Biotechnology + Chemistry + Computer Science			
	Biotechnology + Chemistry + Zoology			
	Botany+ Chemistry + Pharmaceutical Chemistry			
	Botany+ Chemistry + Zoology			
	Chemistry + Mathematics+ Physics			
	Chemistry+ Microbiology+ Zoology			
	Computer Science+ Mathematics+ Physics			
	Electronics+ Mathematics + Physics			
	Physics+ Mathematics+ Statistics			
	Botany + Horticulture + Seed Technology			
	Fisheries + Chemistry+ Zoology			
M.Sc.	M.ScBio Chemistry	PG	Attained	Provide basic
	M.ScBio Technology	_	profound	foundations with a
	M.Sc. – Botany		expertise in	sound knowledge
	M.Sc. – Chemistry		Discipline	of underlying
	M.Sc Computer Sc.		Attain ability to	principles along
	M.Sc. – Fisheries		exercise research	with recent
	M.Sc. – Forensic Sc.	_	intelligence in	developments
	M.Sc. – Geology	_ - -	investigation Incorporated self-directed and lifelong learning	Ability to plan and execute their own
	M.Sc. – Mathematics			innovative ideas in
	M.Sc. – Microbiology			the form of
	M.ScPharma. Chem.			projects, product
	M.Sc. – Physics	4		design and
	M.Sc. – Statistics	1		development
	M.Sc. – Zoology			Enable students to
				work with state-of-

			T 1
			the art
3 6 701 11	The City of the Ci		technologies
M.Phil.	Bio Chemistry	Curricula of	Develop an
	Bio Technology	M.Phil.	understanding of
	Botany	Programmed is	the different
	Chemistry	designed to	theoretical and
	Comp. Sc.	enable students	empirical
	Zoology	develop:	frameworks that
		Thorough and	have defined and
		up-to-date	shaped the field of
		knowledge in the	student
		disciplines of	counselling.
		their choice at	• Develop
		the forefront of a	expertise in one or
		particular field.	more relevant
		• The ability to	research
		critically evaluate	methodologies. •
		information and	Build expertise in
		ideas and apply	formulating
		multiple	testable
		perspectives.	hypotheses and
		• The potential to	design
		demonstrate	appropriate
		effective	studies.
		strategies and	• Develop
		methodologies	competence as a
		applicable to	counsellor to assist
		specific	students in dealing
		educational	with personal,
		domain.	educational and
		• Adequate skills	social problems.
		for competent	
		problem solving	
		• Evaluate one's	
		own research in	
		relation to	
		important and	
		recent issues in	
		their specialized	
		field.	
		Proficiency to	
		communicate	
		research findings	
		at diverse levels	

COURSE OUT COMES



Govt. Holkar (Model. Autonomous) Science College, Indore			
	Department of Biochemistry		
	Class-B.Sc. 1st year		
	Title of the Paper I: Biomolecules		
	Course Code: 101-I		
	<u>Course Objective</u> : To gain knowledge about the essential molecules of life and their importance in body system.		
	Course Outcomes		
CO1	Describe the role of water in living organisms, structure and importance of carbohydrates.		
CO2	Describes classification, structure, properties and importance of Lipids		
CO3	Explain the introduction, classification and functions of Proteins.		
CO4	Students will gain the role and nature of nucleic acids.		
CO5	Explain the classification and importance of porphyrins. Role of hormones in cellular signalling of peptides and steroid hormones.		

	Title of the Paper II: Biophysical and biochemical techniques		
	Course Code: 101-II		
<u>Course Objective</u> : To understand various techniques involve in biochemistry.			
	Course Outcomes		
CO1	Students will acquire knowledge about bioenergetics, free energy, biological oxidation-reduction reaction and high energy phosphate compounds.		
CO2	Students will understand different hydrodynamic methods.		
CO3	Students will gain knowledge of separation techniques i.e chromatography, electrophoresis.		
CO4	Explain the principle and applications of Spectroscopic and immunological techniques.		
CO5	Understanding the principle of radiochemistry and its applications in determining radioactivity in living systems.		

Govt. Holkar (Model. Autonomous) Science College, Indore		
	Department of Biochemistry	
	Class-B.Sc. 2nd year	
	Title of the Paper I: Enzymology	
	Course Code: 201-I	
Course Ob	pjective: To understand about enzyme system and application of enzymes.	
	Course Outcomes	
CO1	Students will acquire fundamental knowledge about the classification and nomenclature of enzymes along with different approaches for isolation and purification of enzymes from various sources.	
CO2	Students will learn about the kinetics of enzymes and can understand the significance of kinetic constants, catalytic rate constant and specificity constant.	
CO3	Describes the classification of multi substrate reactions and types of Inhibition for an enzyme-catalysed reaction.	
CO4	This will impart insight about the mechanism of catalysis of different enzymes and multienzyme complexes	
CO5	Student will understand about the regulation of enzyme activity and applications of immobilized enzymes	

Title of the Paper II: Intermediary Metabolism			
	Course Code: 201-II		
	<u>Course Objective</u> : To understand about various metabolic pathways of cell and their regulations.		
	Course Outcomes		
CO1	Describes metabolism of carbohydrate concerning glycolysis, glycogenolysis, glycogenesis, gluconeogenesis, Degradation of carbohydrate through Kreb's cycle, HMP pathway.		
CO2	Students would understand the components of electron transport chain with electron flow mechanism.		
CO3	Student would get an insight into different oxidation processes for lipid metabolism and biosynthesis of fatty acid.		
CO4	Describes Amino acid metabolism, degradation and biosynthesis of amino acids.		
CO5	Nucleotide metabolism, regulation of Purine and Pyrimidine biosynthesis.		
Department of Biochemistry			
Class-B.Sc. 3rd year			

Title of the Paper I: Molecular Biology			
	Course Code: 301-I		
<u>Course Objective</u> : To understand about various molecular processes in cell.			
	Course Outcomes		
CO1	Understand the structural organization of DNA in the formation of nuclear material		
CO2	Learn the basic steps involved in DNA replication in prokaryotes and eukaryotes, emphasizing the enzymes involved in different types of replications.		
CO3	Student would gain knowledge about the process and enzymes involved in the formation of RNA from DNA in prokaryotes and eukaryotes		
CO4	Understand the steps and enzymes involved in the synthesis of protein, post-translational processing, Students would learn about the regulation of gene expression in prokaryotes and eukaryotes.		
CO5	Molecular basis of mutation and recombinant DNA technology		

Title of the Paper II: Nutritional, Clinical & Environmental Biochemistry			
	Course Code: 301-II		
Course Ob	<u>Course Objective</u> : To understand about nutritional aspect and clinical processes in body.		
	Course Outcomes		
CO1	Students would get knowledge about a balanced diet, nutritional value of vitamins and minerals.		
CO2	Students would learn about calorimetry, Respiratory quotient, BMR and energy requirement for different groups of human beings.		
CO3	Students would get knowledge about the collection and preservation of biological fluids and their importance.		
CO4	Describe the role of enzymes in the diagnosis of various diseases.		
CO5	Students would acquire knowledge about the causes and effect of water pollution and its impact on the environment		

	Govt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Biochemistry	
	Class- M.Sc. 1st SEM	
	Title of the Paper I: Chemistry of Biomolecules	
	Course Code: BC-11	
Course O	bjective: To understand about various biological molecules and their functional properties.	
	Course Outcomes	
CO1	Describes the classification, structure, properties and biological importance of carbohydrates	
CO2	Explains the classification, structure, properties of amino acid along with protein and also different levels of organizations in protein.	
CO3	Describes classification, structure, properties and importance of Lipids	
CO4	Describes the structure, properties and components of nucleic acid.	
CO5	Explains the properties and functions of vitamins with their coenzyme activity and identify the mechanism of hormone action.	
	Title of the Paper II: Analytical Biochemistry	
	Course Code: BC-12	
Course O	bjective : To understand various techniques of biochemistry with their principles and es.	
	Course Outcomes	
CO1	Understanding the basic concept of pH, acid, base and different types of chromatography.	
CO2	Explains instrumentation and applications of ion exchange, gel filtration, affinity chromatography and HPLC.	
CO3	Understanding principle and applications of different types of electrophoresis and centrifugation in biological investigations.	
CO4	Understanding the principle of radiochemistry and its applications in determining radioactivity in living systems.	
CO5	Fundamental laws related to photometry and its application in UV Visible and atomic absorption spectroscopy in the characterization of biomolecules. Principle and applications of ORD, CD and X-Ray diffraction in determining the structure of molecules.	

Title of the Paper III: Cell Biology			
	Course Code: BC-13		
Course Ob	Course Objective: To understand cell components and cellular mechanisms.		
	Course Outcomes		
CO1	Understanding the structure of cells and various models proposed for the organization of plasma membrane		
CO2	Students would learn about different types of transport systems across the plasma membrane.		
CO3	Understanding the structure and function of mitochondria and chloroplast		
CO4	Describes various subcellular organelles involved in synthesis and transport of protein within the cellular system		
CO5	Understanding the mechanism of secretion in cell involving Golgi body and lysosomes. Structure and role of the nucleus in hereditary.		

Title of the Paper IV: Biostatistics			
	Course Code: BC-14		
Course Ob	jective: To understand various biostatistical methods and tools used in research.		
	<u>Course Outcomes</u>		
CO1	Understanding different methods for the collection of data and various ways of representing it.		
CO2	Students would learn about calculation and the importance of measure of central tendency and dispersion.		
CO3	Calculation of correlation and regression between two variables.		
CO4	Understanding the concept of probability and its types along with different ways for distribution of data.		
CO5	Students would acquire knowledge about different tests of significance and ANOVA with their applications in biochemistry.		

Govt. Holkar (Model. Autonomous) Science College, Indore		
	Department of Biochemistry	
	Class- M.Sc. 2nd SEM	
	Title of the Paper I: Physiology	
	Course Code: BC-21	
Course Ob	jective: To understand various body systems and their physiology.	
	Course Outcomes	
CO1	To gain knowledge about various components of blood with their role and process of blood coagulation.	
CO2	Understanding the mechanism of urine formation in kidney and its role in the maintenance of water and electrolyte balance.	
CO3	Understanding the process of gaseous exchange in tissues and lungs, adaptation in respiration at higher altitudes	
CO4	Students would gain insight into the components and processes involved in the contraction of muscles.	
CO5	Fundamental process behind the conduction of nerve impulse and neuromuscular junction.	

Title of the Paper II: Microbial Biochemistry		
	Course Code: BC-22	
Course Ob	Course Objective: To understand the microorganisms cell system and various growth	
mediums us	ed to propagate microorganisms.	
	Course Outcomes	
CO1	Understanding the classification and importance of microorganism as a model system in genetics and biochemistry involving the identification	
CO2	Students would get acquainted with routine practices in microbiological work such as sterilization, microbial nutrition, culture media.	
CO3	Understanding various metabolic process going on in microorganisms such as respiration, fermentation, photosynthesis along with applications of microorganism in the food and dairy industry	
CO4	Students would gain knowledge about different types of fermenters and fermentation processes, the role of microbes in the assay of biomolecules	
CO5	Students would know about classification, structure, properties and various diseases caused by viruses.	

Title of the Paper III: Nutritional Biochemistry		
	Course Code: BC-23	
Course Objective: To understand about essential nutrient components required for human		
body and as	sociated daily requirement.	
	Course Outcomes	
CO1	Students would learn about calorimetry, Respiratory quotient, BMR and energy requirement for different groups of the human being.	
CO2	To understand the nutritional aspects of carbohydrates and lipids.	
CO3	Learn about various parameters to assess the quality of protein in terms of nutritional aspects.	
CO4	Students would get knowledge about the nutritional value of vitamins and minerals.	
CO5	To gain insight about Balanced diet, antinutrients, food processing, proteinenergy malnutrition and starvation.	

Title of the Paper IV: Genetics		
	Course Code: BC-24	
Course Obgenetics.	<u>Course Objective</u> : To understand the various concepts, rules and methods involved in genetics.	
	Course Outcomes	
CO1	Student would understand Mendel's fundamental law of inheritance along with its extension and also linkage, recombination and crossing over.	
CO2	Student would learn to do genetic mapping through two and three factor genetic cross.	
CO3	Describes recombination in bacteriophage, complementation test and its role in genetic mapping.	
CO4	Methods for the transfer of genetic material in microorganisms involving transformation, conjugation and transduction.	
CO5	Students would gain knowledge about different types of mutations, mutagens, transposable elements and DNA repair mechanisms.	

Govt. Holkar (Model. Autonomous) Science College, Indore			
	Department of Biochemistry		
	Class- M.Sc. 3rd SEM		
	Title of the Paper I: Enzymology		
	Course Code: BC-31		
Course Ol	<u>Course Objective</u> : To understand the enzyme properties and kinetics.		
	<u>Course Outcomes</u>		
CO1	Students will acquire fundamental knowledge about the classification and nomenclature of enzymes along with different approaches for isolation and purification of enzymes from various sources.		
CO2	Students will learn about the kinetics of enzymes and can understand the significance of kinetic constants, the catalytic rate constant and specificity constant.		
CO3	Describes the classification of multi-substrate reactions and types of Inhibition for enzyme catalysed reaction.		
CO4	This will impart insight about the mechanism of catalysis of different enzymes and multienzyme complexes		
CO5	Student will understand about the regulation of enzyme activity and applications of immobilized enzymes		

Title of the Paper II: Metabolism I	
Course Code: BC-32	
<u>Course Objective</u> : To understand various cellular metabolic pathways.	
Course Outcomes	
CO1	Student would understand the importance of free energy, exergonic, endergonic reaction, high energy compounds and components of electron transport chain with electron flow mechanism
CO2	Describes metabolism of carbohydrate concerning glycolysis, glycogenolysis, glycogenesis, gluconeogenesis and role of the hormone in blood sugar regulation
CO3	Degradation of carbohydrate through Kreb's cycle, HMP pathway and pyruvate dehydrogenase complex.
CO4	Student would get an insight into different oxidation processes for lipid metabolism and biosynthesis of fatty acid.
CO5	Metabolic reaction for synthesis and degradation of phospholipid and glycolipid, metabolism of cholesterol and bile acids.

Title of the Paper III: Elective 1 Plant Biochemistry	
Course Code: BC-33-A	
<u>Course Objective</u> : To understand various cellular pathways and physiology of plants.	
Course Outcomes	
CO1	The paper conglomerates biochemical and cellular aspects of photosynthesis in plants.
CO2	Student would learn about different cycle operating in plants for respiration viz C3, C4, Cam cycle.
CO3	Describes nitrogen metabolism involving Nitrogen fixation and mechanism of action of nitrogenase complex, Nitrate metabolism.
CO4	Process of ammonia assimilation, nitrification and denitrification, translocation of organic and inorganic substances
CO5	Student would get insight about defence system in plants, structure and function of plant hormones, secondary metabolites of plants

Title of the Paper IV: Elective 1 Environmental Toxicology	
Course Code: BC-33-B	
<u>Course Objective</u> : To understand toxins and their effect on environment.	
Course Outcomes	
CO1	Gives an idea about types of toxic substances, dose-response relationship and phase I and II reaction for detoxification
CO2	Explains tissue and organ specificity for toxicity, food toxicology, Metabolism of haloalkanes, haloalkenes and paracetamol
CO3	Student would know about the toxicology of pesticides, insecticide and herbicide, metal toxicity
CO4	Students would acquire knowledge about causes and effect of water pollution and its impact on the environment
CO5	It deals with the toxicity of natural and household products and test for toxicity

Title of the Paper V: Biotechnology (Elective 2)	
Course Code: BC-34-A	
<u>Course Objective</u> : To understand various techniques Involved in Biotechnology.	
Course Outcomes	
CO1	Students would gain knowledge about Recombinant DNA technology by studying restriction enzymes and using them in the construction of Genomic and cDNA libraries.
CO2	It deals with different types of vectors used in RDT and their selection and screening
CO3	Students would learn various blotting techniques for analysis of genome and molecular markers like RFLP, RAPD, AFLP
CO4	Describe technique for invitro replication of DNA by PCR and its variation, DNA sequencing technique
CO5	Students would get an insight into transformation and transfection methods in animals and plants respectively, application of genetic engineering.

Title of the Paper VI: Advanced Biochemistry (Elective 2)	
Course Code: BC-34-B	
<u>Course Objective</u> : To understand advance techniques and key pathways of biochemistry.	
Course Outcomes	
CO1	Describe the organisation and structure of eukaryotic chromosomes
CO2	It would help to learn methods for isolation of genomes, blotting technique, genetic mapping through molecular markers
CO3	Explain different ways of cell signalling and the role of various signalling molecules in signal transduction
CO4	Students would get an insight into the mechanism behind photosynthesis in plants, nitrogen metabolism including nitrogen fixation
CO5	It would make students acquainted with inborn error associated with protein, carbohydrate and lipid metabolism

Title of the Paper VII: Biochemical Techniques (Open Elective)	
Course Code: BC-35	
<u>Course Objective</u> : To understand the concepts of various techniques in biochemistry.	
Course Outcomes	
CO1	Students will get deeper understanding of pH, ionization and biological buffer systems.
CO2	Understanding of various types of chromatographic techniques.
CO3	Learn about electrophoresis technique along with the concept of sedimentation.
CO4	Student will gain knowledge about the concept of radioactivity and various radioisotopes used for research.
CO5	Learn about spectroscopy and various detection tools based on light properties.

Govt. Holkar (Model. Autonomous) Science College, Indore		
	Department of Biochemistry	
	Class- M.Sc. 4th SEM	
Title of the Paper I: Molecular Biology		
Course Code: BC-41		
<u>Course Objective</u> : To study the molecular structure of DNA and understand the central dogma scheme of molecular biology.		
	Course Outcomes	
CO1	Understand the structural organization of DNA in formation of nuclear material	
CO2	Learn the basic steps involved in DNA replication in prokaryotes and eukaryotes, emphasizing the enzymes involved in different types of replications.	
CO3	Student would gain knowledge about process and enzymes involved in formation of RNA from DNA in prokaryotes and eukaryotes	
CO4	Understand the steps and enzymes involved in synthesis of protein, post translational processing	
CO5	Students would learn about regulation of gene expression in prokaryotes and eukaryotes.	

	Title of the Paper II: Clinical Biochemistry
Course Code: BC-42	
Course Ob	jective : To understand the concept of body homeostasis and clinical aspect of
biochemica	l processes.
	Course Outcomes
CO1	Understand acid-base and water-electrolyte balance in the body, mode of action of different antibiotics
CO2	Understand various carbohydrate associated and lipid metabolic disorders.
CO3	Learn about evaluation of various organ function test, physiological significance of bile pigments
CO4	Describe role of enzymes in diagnosis of various diseases, chemical nature and physiological significance of porphyrin
CO5	Understand the causes and mechanism behind carcinogenesis.
	Title of the Paper III: Immunology (Elective 3)
	Course Code: BC-43-A
	<u>jective</u> : To understand various types of cells and components of immune system.to of various immunological detection techniques.
	Course Outcomes
CO1	Understand types of Immunity, physiology of immune response, structure and types of immunoglobulins
CO2	Describe the components of the immune system and how cells and organs play an important role in the immune responses
CO3	Understand structure and function of MHC molecules, the role of the HLA antigens in the transplantation of the various organs and graft rejection
CO4	Critically understand the abnormal manifestations of the immune response in the form of Hypersensitive reactions and role of complement system in immunity
CO5	Study the principle and applications of various immunological techniques ranging from precipitation and agglutination reactions to ELISA, Radio immunoassay, production of monoclonal antibody

Title of the Paper IV: Computer Applications (Elective 3)			
	Course Code: BC-43-B		
<u>Course Objective</u> : To understand various computational tools used in the field of biological sciences.			
Course Outcomes			
CO1	Will understand about basics of computer and its use in bioinformatics.		
CO2	Learn about various bioinformatics resources and databases like NCBI. PDB, GenBank etc.		
CO3	Will get insight into sequence analysis and various phylogenetics tool.		
CO4	Critically understand the gene sequence and sequence alignment tools.		
CO5	Will expose to advancements in Bioinformatics.		

Title of the Paper V: Metabolism II (Elective 4)		
Course Code: BC-44-A		
<u>Course Objective</u> : To understand various metabolic pathways of biochemistry.		
Course Outcomes		
CO1	Student would get insight about digestion, absorption and metabolism of protein	
CO2	Understand glucogenic, ketogenic amino acid and their associated inborn errors of metabolism.	
CO3	Learn about metabolism of sulphur containing, acidic, basic, branched chain and aromatic amino acid	
CO4	Deals with metabolism of nucleic acid and inherited disorders of purine and pyrimidine metabolism	
CO5	Describes biological role of mineral, trace element and toxic effect of heavy metal.	

Title of the Paper VI: Scientific Writing (Elective 4)		
Course Code: BC-44-B		
Course Objective: To understand the components of scientific paper and what are the		
requirements of a good scientific writing.		
Course Outcomes		
CO1	Gives introduction of research, research process and formulation of research problem	
CO2	Learn about hypothesis and process of setting hypothesis, use of concept	
CO3	Understand components of research design for various types of research	
CO4	Deals with methods for collection of data and types of data	
CO5	Describes the meaning of interpretation and report writing.	

Govt. Holkar (Model. Autonomous) Science College, Indore		
	Department of Biochemistry	
	Class-M.Phil 1st semester	
Title of the Paper I: Review of Related Literature		
Course Code: MPBC-11		
<u>Course Objective</u> : To gain knowledge about the components of scientific literature and the essential review process.		
	Course Outcomes	
CO1	Students would be introduced to the basics of literature review.	
CO2	Understand the basic source of information to be collected for literature	
CO3	Equip with the process of literature review	
CO4	Will be able to signalling a gap in previous research and using this to justify own.	
CO5	Learn about Types of citation and referencing system.	
CO6	Student will learn to prepare review of literature on his/her own topic.	

Title of the Paper II: Computer Application		
Course Code: MPBC-12		
<u>Course Objective</u> : To gain knowledge about the basics of computers and its effective use in the field of biochemistry and research.		
Course Outcomes		
CO1	Student would be introduced to basic functions and components of computer software and hardware.	
CO2	Understand about the computer networking and different internet platforms.	
CO3	Learn about spreads sheet tools, so can prepare statistical data.	
CO4	Students would be introduced to presentation tools like MS power point.	
CO5	Learn about the applications of computers in biochemistry	

'Title of the Paper III: Quantitative Techniques		
Course Code: MPBC-13		
Course Objective: To gain knowledge about the various biostatistical tools useful for research in biochemistry.		
Course Outcomes		
CO1	Students will be introduced to different quantitative techniques and the process of data collection	
CO2	Students will learn various biostatistical tools like mean, median, mode, etc.	
CO3	Will understand the correlation and regression.	
CO4	will get insight into more tools like test of significance and chi square test.	
CO5	Will be able to do analysis of variance for forecasting the results.	

Title of the Paper IV: Research methodology			
Course Code: MPBC-14			
<u>Course Objective</u> : To gain knowledge about the components and processes in research methodology.			
<u>Course Outcomes</u>			
CO1	Students will be introduced to research methods and research process.		
CO2	Understand about the hypothesis and concept making in research.		
CO3	Learn about the basics of research design for formulating research studies		
CO4	Student will get insight into sources and methods of data collection.		
CO5	Learn about interpretation of scientific data.		

Govt. Holkar (Model. Autonomous) Science College, Indore			
	Department of Biochemistry		
	Class-M.Phil 2nd semester		
	Title of the Paper I: Advanced Biochemistry		
Course Code: MPBC-21			
<u>Course Objective</u> : To gain knowledge the structural component of cell and various cellular processes to maintain homeostasis.			
	Course Outcomes		
CO1	Students would understand about genome organisation in eukaryotic and prokaryotic cells.		
CO2	Learn various molecular biology techniques liker isolation of DNA PCR, blotting techniques etc.		
CO3	Will get insight into cell signalling pathway and associated proteins involved.		
CO4	Understand the process and photosynthesis and nitrogen fixation in plants.		
CO5	Student would get understanding of inborn errors of metabolism.		

Title of the Paper II: Instrumentation and Enzymology		
Course Code: MPBC-22		
<u>Course Objective</u> : To gain understanding of various biochemical techniques along with the enzyme system and its use in various fields.		
Course Outcomes		
CO1	Will learn about the biochemical techniques including homogenisation and chromatographic separation of biological samples	
CO2	Will equip with the techniques for quantitation and Characterization of Biomolecules.	
CO3	Understand components of enzyme activity and kinetic characterization of enzymes.	
CO4	Learn about enzyme immobilization technique and production of enzyme at large scale using reactors.	
CO5	Students will get deeper understanding of use of enzymes in various fields like industry, medicine, detergent etc.	

BIOINFORMATICS

Subject: Bioinformatics

Course

1 Code

2 Course Title

Course Type (Core/Elective/Generic

B Elective/V ocational/...)

Pre-

4 requisite (If any)

5 Course Learning Outcomes (CLO)

S1-BINF1T

General Introduction to Bioinformatics

Core Course

To study this course, a student must have Biology and/or Mathematics as one of the subjects in class 12 Students shall be able to -

The students shall be able to:

1.Get the general overview of internet

protocols and

general introduction of bioinformatics. 2.Acquire the knowledge about the

biological

databases, sequence alignments, data

retrieval

system, phylogenetic analysis and

comparative genome analysis.

3. Join as lab assistant/ technical assistant

in any R&D

project in Life sciences.

Program: Class: B.Sc. Year: FIRST

Subject: Bioinformatics

Course

1 Code

2 Course Title

Course Type (Core/Elective/Generic

3 Elective/ Vocational/...)

Pre-

4 requisite (If any)

5 Course Learning Outcomes (CLO)

S1-BINF2P

Practical in General Introduction to

Bioinformatics

Core Course

To study this course, a student must have Biology and/or Mathematics as one of the subjects in class 12l The students shall be able to:

1.Retrieve the DNA/Protein

sequences from databases and analyze them using bioinformatics tools. 2. Perform multiple sequence alignment using bioinformatics tools. 3. Visualize the structures of proteins. Program: B.Sc. Bioinformatics Class: B.Sc. Year II

Subject: Bioinformatics

Course Code C202 – I

Course Title Introductions to computer and programing

Course Type Core Course

Pre-requisite (If Any) To study this course, a student must have Passed B.Sc. I Year in Bioinformatics.

Course Learning Outcome Course Objectives: to equip students with fundamental knowledge and concepts

of computers and basics programming skills.

Course Outcomes: After the completion of this course students will have

understanding of-

CO1: This course gives a basic knowledge about the computer and different type

of computer system.

CO2: Student gets the information about hard ware part of the computer which

helps to start professional carrier.

CO3: Course gives the idea about the different operating system. Its installation

and package related information student can pursue as a profession also.

CO4: To understand data presentation techniques and basic knowledge

of computer programming and application designing.

CO5: To understand the use of the internet and its essential components of

multimedia

Program: B.Sc. Bioinformatics		Class B.Sc.	Year II
		Subject: Bioinformatics	
1	Course Code	C202 II	
2	Course Title	Structural Bioinformatics	
3	Course Type	Core Course	
4	Pre-requisite (If Any)	To study this course, a student must have Passed B.Sc. I Year in Bioinformatics.	
5 Course Learning Outcome		Course Objectives: To underst macro molecules and experime To know the approaches for st Course Outcomes: After the counderstanding of—CO1: To understand the basics CO2: This course helps to get interaction. CO3: Student have enhanced of and experimental methods also and lab practices.	ompletion of this course students will have s of Macromolecular structural properties. knowledge about the biological own skill related biophysical techniques o gives an opportunity of job and research e knowledge about the innovative

Program: B.Sc. Bioinformatics		Class B.Sc. Subject: Bioi	Year III nformatics
1 2 3 4	Course Code Course Title Course Type Pre-requisite (If Any)	C302-II Paper- II Mathema Core Course	ics For Biological Sciences e a student must have Passed BSc II Year in
5	Course Learning Outcome	Course Objectives relevant to biology Course Outcomes understanding of-CO1: Basic knowl useful for competit CO2: This course CO3: It gives basic CO4: Numerical comethodology.	covered logical interpretation of structural dimension. c knowledge of Calculus. omputation is a major area of machine learning y and analytical Geometry is essential for geological
	rogram: B.Sc. Bioinformatics Subject: Bioinformatics Course Code	C302 – I	
Course Title Course Type Pre-requisite (If Any) Course Learning Outcome		Course Objectives: To data handling. Course Outcomes: Af understanding of- CO1: Basics of Biosta CO2: They will perfo of data in large scale of CO3: Students have in CO4: They can use the correlation and the region of the correlation of the	lea of retrieval of statistical output from the big data. e statistical inference of the research hypothesis with the

ward.

BIOTECHNOLOGY

Class: B.Sc. Year: FIRST

Subject: Biotechnology

1 Course Code CORETH-1-SI-BTEC1 T

2 Course Title Cell Biology and Biochemistry

Core Course

Course Type

3 (Core/Elective/Generic Elective/V ocational/...)

4 Pre-requisite (If any) To study this

5 Course Learning Outcomes (CLO) To study this course, a student must have had the subject Biology in 12th class.

Course Objective :- The Main Objective of the course will be to build the basic foundation for studying Biotechnology. The Demand For Trained workforce in Biotechnology is ever growing in Fundamental Research and Industry Sector. Academic and Research Sectors also Require Interdisciplinary trained manpower to foster the Biotechnology Revolution. The restructured syllabus combines basic principles of Chemical and Biological sciences in light of advancements in technology. The curriculum aims to impart basic knowledge with emphasis on its applications to make the students ready for industries and research work in concerned field-Learning Outcome :- At the end of the paper. a student should be able to:

- 1.Understand basics of cell biology.
- 2.Appreciate the importance of bonding and spatial arrangements of molecules for proper functioning and stability.
- 3.Understand both the physical as well as chemical properties of biomolecules
- 4. The Student Could Pursue a career in biochemical testing. The decrease of increase in the amount of some of the biomolecules can have clinical significance.
- 5. Students can also go in for medical Laboratory Technique Courses, opening opportunities in hospitals and pathological laboratories,

Class: B.Sc. Year: FIRST

Subject: Biotechnology

1 Course Code Microbiology and Immunology

Course Title Core Course

Course Type

To study this course a student must have had the subject Biology in class 12th.

3 (Core/Elective/Generic Elective/V ocational/...)

4 Pre-requisite (If any) Course Objectives: To create general understanding about microbiology and immunology

5 Course Learning
Outcomes (CLO)

Course Objectives: To create general understanding about microbiology and immunology

1 .The students will be able to understand microbial diversity and Nutrition.

2. The students will be able to understand immune system. Immune responses and Vaccination.

3. The students will be able to describe role of immune system

in both maintaining health and contributing to disease.

4. The students will be able to understand immunological techniques.

Course Learning Outcomes: At the end of the course student will familiar with -

1. Microbial diversity and nutrition.

2.Immune system, its properties and types.

3.Immunoglobulin structure, types and functions and can apply

the concept of hypersensitivity and vaccination

for different diseases.

4 Perform various immunological techniques.

GOVT. HOLKAR [Model, Autonomous] SCIENCE COLLEGE, A. B. Road, INDORE DEPARTMENT OF BIOTECHNOLOGY

Syllabus of B.Sc. (Biotechnology) Part A: Introduction for Code

Program: B.Sc. Biotechnology Class: B.Sc. Year II Session 2021-22

Subject: Biotechnology

Course Code C203 – I

Course Title Paper I: Biophysics and Biochemistry

Course Type Core Course

Pre-requisite (**If Any**) To study this course, a student must have Passed B.Sc. I Year in Biotechnology.

Course Learning Outcome After the completion of this course students will have understanding of-

CO1: Basics of fundamentals of bioenergetics.

CO2: Basics of various Biophysical methods and their applications.

CO3: Basic concept of biochemistry, different types of bonds, Structure and function,

Concept of pH, acid, base and buffer.

CO4: To Know the Classification, structure and properties of carbohydrates, lipids,

Amino acids, Proteins and nucleic acids.

CO5: Mechanism of enzyme catalysis, enzyme kinetics and enzyme regulation.

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Syllabus of B.Sc. (Biotechnology)
Part A: Introduction for Code

Program: B.Sc. Biotechnology Class B.Sc. Year II

Subject: Biotechnology

1 Course Code C203-II

2 Course Title Paper II: Bioinstrumentation, Biostatistics and Bioinformatics

3 Course Type Core Course

4 Pre-requisite (If Any) To study this course, a student must have Passed B.Sc. I Year in

Biotechnology.

5 Course Learning After the completion of this course students will have understanding of—

Outcome CO1: Basic knowledge of Microscopy and separation of biomolecules by

centrifugation.

CO2: Basic knowledge of Chromatography and electrophoresis. CO3: Basic knowledge of spectrophotometry and colorimetry. CO4: Basic knowledge of Biostatistics in the field of biology.

CO5: Basics of Computer and Basic Bioinformatics.

Part A: Introduction for Code

Program: B.Sc. Biotechnology Class: B.Sc. Year III

Subject: Biotechnology

Course Code C303 – I

Course Title Paper I: Molecular Biology & Genetic Engineering

Course Type Core Course

Pre-requisite (If Any)To study this course a student must have Passed BSc II Year in Biotechnology

Course Learning Outcome CO1: Idea of genome organization and DNA kinetics.

CO2: Basic concept of DNA, it's structure, Replication and recombination.

CO3: Prokaryotic and eukaryotic transcription and their regulation

CO4: Post Transcriptional modification and translation **CO5:** Various types of mutations and their mechanism.

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Syllabus of B.Sc. (Biotechnology)
Part A: Introduction for Code

Program: B.Sc. Biotechnology Class B.Sc. Year III

Subject: Biotechnology

1 Course Code C303-II

2 Course Title Paper- II Applied Biotechnology

3 Course Type Core Course

4 Pre-requisite (If Any) To study this course a student must have Passed BSc II Year in

Biotechnology

5 Course Learning CO1: Basic knowledge of Microbial contamination & Spoilage.

Outcome CO2: Basic knowledge about plant tissue culture and in vitro culture.

CO3: Basic knowledge about Immunity, Immunoglobulin's and animal cell

culture technology.

CO4: Basic concept of Fermentation, Types of fermentation and fermenters.

CO5: Basic concept of Environment and Environmental Biotechnology.

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Syllabus Session:

Program: Class: M.Sc. Semester: I

Subject: Biotechnology

Course BT-11

Code

Course Paper I: (Biochemistry)

Title

Course Course

Type

Course Outcomes: After the completion of this course students will have

understanding of

Course Learning Outcomes

CO1: Classification, structure and properties of amino acids and proteins.1

CO2: Mechanism of enzyme catalysis, enzyme kinetics and enzyme

regulation.

CO3: Classification, structure and properties of carbohydrates and lipids.

CO4: Structure of cell membrane and its various functions.

CO5: Fundamental chemical principles that govern complex biological

systems as well as role of biomolecules in metabolic pathways.

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY Syllabus Session:

Subject: Biotechnology

BT-12

Paper II (Cell and Development Biology)

Core Course

Course Outcomes: After the completion of this course students will have understanding of –

CO1: Microscopy and membrane structure and its function.

CO2: Basics concept of cell organelles and their origin and evolution.

CO3: The basics knowledge of end membrane system and their motility.

CO4: Cell cycle and development of drosophila.

CO5: The basics knowledge of plant Meristem organization and Differentiation of specialized cells.

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Subject: Biotechnology

Program: Class: M.Sc. Semester: I

Subject: Biotechnology

Course Code BT-13

Course Title Paper III (Microbiology)

Course Type Core Course

Pre-requisite (If any) B.Sc. in any Life Science Stream

Course Learning Outcomes Course Outcomes: After the completion of this course students will have understanding of –

- CO1. Classification of microorganism and their structure.
- CO2. Various media and culturing techniques.
- CO3. Microbial growth, its types, parameters and factors affecting.
- CO4. Mechanism of pathogenesis and mode of action of toxins.

CO5. Virology and mycology.

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Subject: Biotechnology

Course Code BT-14

Course Title Paper IV (Biostatistics and Bioinformatics)

Course Type Core Course

Course Learning Outcomes Course Outcomes: After the completion of this course students will have understanding of –

CO1: Applications of biological data for statistical analysis and major output from the biological big data.

CO2: Statistical analysis is now days a research-oriented branch for the students.

CO3: Basic knowledge about the computational data management and data organization.

CO4: How to deal with biological data, management of biological database and also use for the analysis

CO5: Basic concepts of machine learning and use techniques like phylogenetic construction.

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE

DEPARTMENT OF BIOTECHNOLOGY

Program: Class: M.Sc. Semester: II

Subject: Biotechnology

Course Code BT-21

Course Title Paper V (Molecular Biology)

Course Type Core Course

Course Learning Outcomes Course Outcomes: After the completion of this course students will have understanding of –

CO1: Idea of genome organization and DNA kinetics.

CO2: Basic concept of DNA, its structure, Replication and recombination.

CO3: Prokaryotic and eukaryotic transcription and their regulation

CO4: Post Transcriptional modification and translation

CO5: Various types of mutations and their mechanism.

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Program: Class: M.Sc. Semester: II Session 2021-22

Subject: Biotechnology

Course Code BT-22

Course Title Paper VI (Bacterial Genetics and Genetic Engineering)

Course Type Core Course

Course Learning Outcomes Course Outcomes: After the completion of this course students will have understanding of –

CO1: Bacterial recombination, Gene mapping and transposable genetic elements.

CO2: Structure, function and types of bacteriophages and plasmid.

CO3: Basic concepts in genetic engineering and recombinant DNA technology.

CO4: Various types of vectors and their properties.

CO5: Versatile tools and techniques used in genetic engineering and their applications

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Semester: II

Subject: Biotechnology

Paper-VII (Immunology)

Core Course

Course Outcomes: After the completion of this course students will have understanding of -

CO1: Design a model of Immunoglobulins. Describe which cell types and organs present in the immune response.

CO2: Illustrate various mechanisms that regulate immune responses and maintain tolerance.

CO3: Adverse effect of immune system including Allergy, hypersensitivity and autoimmunity.

CO4: Apply basic techniques for identifying antigen antibody interactions.

CO5: Immunological response against tumor and blood transfusion, Elucidate the reasons for immunization and aware of different vaccination

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Semester: II

Subject: Biotechnology

BT-24

Course Outcomes: After the completion of course, students will have understanding of

CO1: Buffers; Ultrafiltration and other membrane techniques &Spectroscopy

Techniques and You will have the basics knowledge about buffers and spectroscopy with all detail knowledge about its applications and instrumentation.

CO2: Chromatography Techniques Electrophoresis techniques with all detail

knowledge about its applications and instrumentation.

CO3: Basics knowledge of Centrifugation and its types with all detail knowledge about its applications and instrumentation.

CO4: The basics concept of Radioactivity and its applications.

CO5: About Advanced Techniques like Protein crystallization, MADI-TOF and Mass spectrometry.

Subject: Biotechnology

BT-31

Paper- IX (ENZYME TECHNOLOGY)

Core Course

M.Sc. Previous. (Biotechnology)

Part A: Iroduction

Semester: III

Subject: Biotechnology

Course Outcomes: After the completion of course, students will have understanding of-

CO1: In-vitro plant culture technique. Callus culture, Embryo culture technique.

CO2: Plant transformation method and techniques for gene transfer.

CO3: Plant Transformation for productivity and performance as well as to know virus resistance, disease resistance plants.

CO4: Metabolic Engineering and Industrial Products like Plant secondary metabolites, Edible vaccine, and to understand the various technique to enhance their production.

CO5: Molecular Marker aided-Breeding techniques like rDNA techniques RFLP maps, RAPD markers, STS, AFLP,

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE

Program: Class: M.Sc. Semester: III

Subject: Biotechnology
Course Code BT-33

Course Title ELECTIVE - I Paper - XI

1/1 (ENVIRONMENTAL BIOTECHNOLOGY)

Course Type ELECTIVE -1/1

Pre-requisite (If any)

M.Sc. Previous. (Biotechnology)

Course Learning Outcomes Course Outcomes: after the completion of course, students will have understanding of

CO1: The basics knowledge of Environment: basic concept and issues, Pollution: Types of pollution,

methods for measurement of pollution

CO2: You have idea about Air and Water pollution: Air pollution and its control through Biotechnology,

CO3: You have idea basics knowledge Treatment schemes for waste water of dairy, distillery, tannery, sugar and antibiotic industries.

CO4: The basics concept uses of microbes in the treatment of Environment.

CO5: You have idea about Bioremediation, Biopesticides & Global environmental problems.

DEPARTMENT OF BIOTECHNOLOGY

Program: Class: M.Sc. Semester: III

Subject: Biotechnology

Course Code BT-33

Course Title ELECTIVE - I Paper - XI

1/2 (STEM CELL BIOLOGY)

Course Type ELECTIVE –1/2

Course Learning Outcomes Course Outcomes: after the completion of course, students

will have understanding of

CO1: The basics knowledge of Stem Cell Biology

CO2: Stem Cell characterization and application of stem cell.

CO3: Basics knowledge of Treatment human stem cell research

CO4: The basics concept of human embryonic stem cells

CO5: About tissue system failure

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Part A: Introduction

Semester: III

Subject: Biotechnology

BT-34

ELECTIVE - II Paper - XII

2/1(FOOD BIOTECHNOLOGY)

M.Sc. Previous. (Biotechnology)

Course Outcomes: After the completion of course, students will have understanding of

CO1: Food Processing and nutritive value of food.

CO2: Concept of Food Preservation and New Preservation Technologies.

CO3: Types of Food Spoilage & Food Borne Diseases.

CO4: Fermented Food Products.

CO5: Microbial analysis of food.

Part A: Introduction

Program: Class: M.Sc. Semester: III

Subject: Biotechnology

Course Code BT-34

Course Title ELECTIVE - II Paper - XII

2/2(Pharmacogenomics)

Course Type ELECTIVE -2/2

Pre-requisite (If any)

M.Sc. Previous. (Biotechnology)

Course Learning Outcomes Course Outcomes: After the completion of course, students will have understanding of

CO1: Pharmacogenomics, benefits, practical applications.

CO2: Concept of drugs legislation and safety

CO3: Genetic biomarkers.

CO4: Techniques in pharmacogenomics.

CO5: Drugs and Cosmetics Act.

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY Syllabus Session:

Program: Class: M.Sc. Semester: III

Subject: Biotechnology

Course Code OE-BB

Course Title Open Elective

(Basic Of Bioinformatics)

Course Type OPEN ELECTIVE

Course Learning Outcomes Course Outcomes: After the completion of course, students will have understanding of

CO1: The basics knowledge of Bioinformatics.

CO2: Basics concept NCBI.

CO3: About types of Protein Structure.

CO4: Data base Analysis Tool.

CO5: Drug Discovery and design.

Part A: Introduction

Program: Class: M.Sc. Semester: III

Subject: Biotechnology

Course Code PRBT-31

Course Title Practical - I (Based on theory paper -IX&X)

ENZYME AND PLANT BIOTECHNOLOGY

Course Type Elective

Course Learning Outcomes Learning Outcomes: at the end of the paper students will be

able to:

C01. Technique of Enzyme and plant biotechnology

C02.To learn isolation of Enzyme

CO3. Pursue Career in Enzyme and plant biotechnology

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Program: Class: M.Sc. Semester: III

Subject: Biotechnology

Course Code PRBT-32

Course Title Practical –II (BASED ONELECTIVE PAPERS)

ENVIRONMENTAL BIOTECHNOLOGY, STEM CELL BIOLOGY, FOOD BIOTECHNOLOGY AND

PHARMACOGENOMICS

Course Type Elective

Course Learning Outcomes Learning Outcomes: at the end of the paper students will be

able to:

C01. Technique of Food environment biotechnology

CO2.To learn isolation of micro-organism

CO3. Pursue Career in Food and Environment biotechnology

Program: Class: M.Sc.

Subject: BiotechnologyCourse Code BT-41

Course Title Paper – XIV- (BIOPROCESS TECHNOLOGY)

Course Type Core Course

Course Learning Outcomes Course Outcomes: After the completion of course, students

will have understanding of

CO1: The basics knowledge of Bioprocess Technology and industrially important microbes.

CO2: Bio-separation and Treatment of effluent and its disposal.

CO3: Types of fermentation processes and Bioreactors.

CO4: Microbial Technology.

CO5: Industrial production.

DEPARTMENT OF BIOTECHNOLOGY

Part A: Introduction

Program: Class: M.Sc. Semester: IV

Subject: BiotechnologyCourse Code BT-42

Course Title Paper - XV – (ANIMAL BIOTECHNOLOGY)

Course Type Core Course

Pre-requisite(If any)

M.Sc. Previous. (Biotechnology)

Course Learning Outcomes Course Outcomes: After the completion of course, students

will have understanding of

CO1: Basic components of prokaryotic and

eukaryotic cells, and observe and correctly identify cellular structures using different microscopic

techniques.

CO2: Cellular components of Prokaryotic and eukaryotic cell and

experimental work as well as in job oriental techniques in cell function.

CO3: The key roles of mitosis and meiosis during the life cycle. Compare and contrast different life cycle strategies, focusing on the human life cycle.

CO4: Distinguish between passive and active transport; they can explain how the substances are directly or indirectly transported across a membrane.

CO5: Concept of Cancer cell and causative agent in cell biology. As well as to know Apoptosis and their mechanism, and how it help in cancer treatment.

Part A: Introduction

Program: Class: M.Sc. Semester: IV

Subject: BiotechnologyCourse Code BT-43

Course Title ELECTIVE – III Paper- XVI

3/1(CANCER GENETICS)

Course Type Elective 3/1

Pre-requisite(If any)

M.Sc. Previous. (Biotechnology)

Course Learning Outcomes Course Outcomes: After the completion of course, students will have understanding of

C01: The basics knowledge of tumors and biochemical and structural changes in cancer cell.

CO2: Concept of oncogenes and their amplification.

CO3: Types of cancer and different types of syndromes.

CO4: Tumor progression and their proliferation.

C05: Gene therapy and there counselling

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Semester: IV

Subject: Biotechnology

BT-44

ELECTIVE - III Paper - XVI

3/2(Bio-Nanotechnology)

Elective 3/2

M.Sc. Previous. (Biotechnology)

Course Outcomes: After the completion of course, students will have understanding of

C01: The basics knowledge of Nano-Biotechnology

CO2: Concept of Spectroscopic techniques.

C03: Methods in nanotechnology.

CO4: Nanoparticles and their synthesis.

C05: DNA nanotechnology

Part A: Introduction

Program: Class: M.Sc. Semester: IV

Subject: BiotechnologyCourse Code BT-44

Course Title ELECTIVE - IV Paper XVII

4/1 (ENGINEERING PRINCIPLES)

Course Type Elective 4/1

Course Learning Outcomes Course Outcomes: After the completion of course, students

will have understanding of

CO1: The basics knowledge of ENGINEERING PRINCIPLES

CO2: Concept of fluid flow and mixing.

C03: Thermodynamic system.

CO4: Heat transfer.

C05: Mass transfer

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Part A: Introduction

Program: Class: M.Sc. Semester: IV

Subject: BiotechnologyCourse Code BT-44

Course Title ELECTIVE- IV Paper-XVII

4/2(GENOMICS, PROTEOMICS, IPR & BIOSAFTEY)

Course Type Elective 4/2 Pre-requisite (If any)

M.Sc. Previous. (Biotechnology)

Course Learning Outcomes Course Outcomes: After the completion of course, students

will have understanding of

CO1: DNA sequencing which is a broad area of

current proteomics and genomics study.

CO2: Different tools for genome analysis. Like RFLP, RAPD, PCR.

CO3: The different proteomic analysis methods,

CO4: This part of the course is completely job-oriented field such as patent, trademark and

copyright

designing for the industries

Part A: Introduction

Program: Class: M.Sc. Semester: IV

Subject: Biotechnology

Course Code PRBT-41

Course Title M.Sc. - Semester - IV (BIOTECHNOLOGY)

Practical - I (Based on theory paper -XIV&XV)

Bioprocess Technology and Animal Biotechnology

Course Type Core Course

Pre-requisite (If any) M.Sc. Previous. (Biotechnology)

Course Learning Outcomes Learning Outcomes: at the end of the paper students will be

able to:

1. Basic Technique of Bioprocess Technology and Animal Biotechnology

2.To learn Isolation of microorganism

3. Pursue Career in Bioprocess Technology and Animal Biotechnology

GOVT. HOLKAR (MODEL, AUTONOMOUS) SCIENCE COLLEGE, INDORE DEPARTMENT OF BIOTECHNOLOGY

Part A: Introduction

Program: Class: M.Sc. Semester: III

Subject: Biotechnology

Course Code OE-BB

Course Title Open Elective

Basic Of Bioinformatics

Course Type OPEN ELECTIVE

Course Learning Outcomes Course Outcomes: After the completion of course, students

will have understanding of

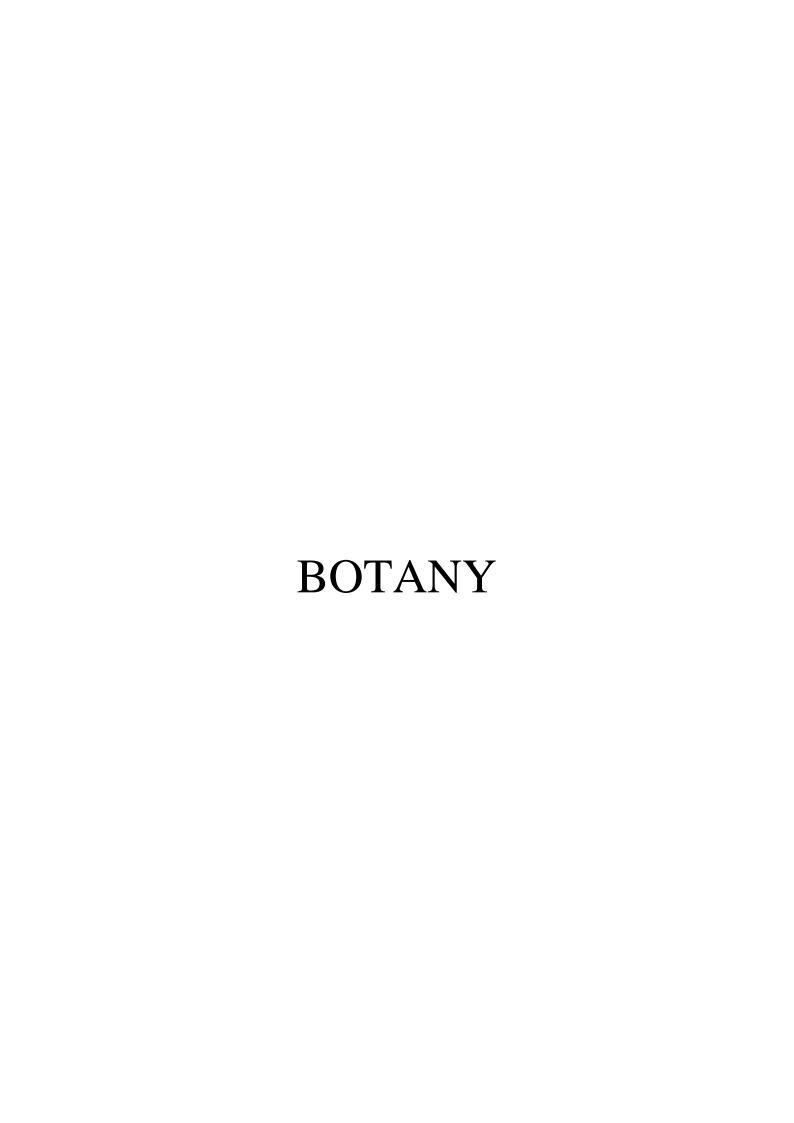
CO1: The basics knowledge of Bioinformatics.

CO2: Basics concept NCBI.

CO3: About types of Protein Structure.

CO4: Data base Analysis Tool.

CO5: Drug Discovery and design.



Govt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany**

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Class B.Sc. I Year Botany

Title of the Paper(Course): Applied Botany

Course Code104-I

CO1: Undrestood the significance and role of botany.

CO2: Learnt the basic aspects of applied botany.

CO3: Gained knowledge about employment opportunities in field of botany

CO4: Gained knowledge about start up oppertunities in field of botany

CO5: Learnt about opportunities of social services.

CO6: Gain knowledge about best health practices.

Govt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany..**

Class B.Sc. I Year Botany

Title of the Paper(Course): Basic Botany 104-II Course Code-

CO1: This course will help the student to understand the diversity of plants and evolutionary process in plant kingdoms.

CO2: It gives an accounts of plant adaptations from aquatic condition to colonize terrestrial habitat

CO3: The changes in morphological, anatomical and reproductive structures that propel plant evolution can be investigated.

CO4: The economic importance and significance of plants in nature will be understood.

CO5: They will be acquainted with locally prevalent microbial diseases of plants and humans.

Govt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany**..

Class B.Sc. I Year Botany

Title of the Paper(Course): Herbal Cosmetic Course
Code- O-108

CO1: Students will learn about raw materials used in herbal cosmetics including the skin and hair care, herbal products preparation and their evaluation

CO2: Students can seek the opportunity of setting up their own business of herbal cosmetic after this course.

Govt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany**

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Class B.Sc. I Year Botany

Title of the Paper(Course): Nursery management

Code- O-116

CO1: It is directly related with entrepreneurship development at small and large scale.

CO2: It gives an opportunity of implementation, advance knowledge of micro propagation including commercial management practices.

CO3: High- tech nursery establishment as a venture s possible after completing this course.

CO4: It also provides skills of practical application for nursery establishment and related businesses such as marketing of coco peat, compost, green manure, soil media and perlite etc.

Govt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany**

.. Class B.Sc. II Year Botany

Title of the Paper(Course): Taxonomy & Embryology of Angiosperms

Course Code- 204-I

Course Outcomes: After the completion of this course students will have understanding of

CO1: Students will come to know about classification of plants. How plants were classified in ancient times.

CO2: Importance and basis of classification as well as need to classify the plants

CO3: Knowledge about flower, how flower plays an important role in the life of plants. Structure and function of floral parts.

CO4: What is pollination how it takes place agencies which plays important role in pollination,

CO5: Fertilization and formation of fruits seed and its role in giving rise to next generation.

ovt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany**

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Class B.Sc. II Year Botany

Title of the Paper(Course): Plant Ecology Biodiversity and Phytogeoraphy

Course Code- 204-II

Course Outcomes: After the completion of this course students will have understanding of

CO1: Student can well understand about Ecosystem and how it works in the environment.

CO2: Soil, its structure, properties and soil testing methods can be well understood. It also helps in making carrier of students.

CO3: Types of Biodiversity i.e. different types of plants, insects, animal and their nature/behavior can be well understood.

CO4: Conservation methods of biodiversity and threats to the wild life can be understood which also important aspect in making carrier.

CO5: Phytogeography gives idea about distribution of plants.

Govt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany**

Class B.Sc. III Year Botany

Title of the Paper(Course): Plant Physiology and Biochemistry

Course Code- 304-I

Course Outcomes: After the completion of this course students will have understanding of

CO1: Students were able to enhance their capability to understand importance of physiological activities in relation to plants.

CO2: Understanding of nutrition and requirements of biomolecules in plants and gains knowledge to fulfill these requirements.

CO3: Importance of Bio catalyst and hormones in various activities of division and development of plants is conceptualize to students.

CO4: The Course will achieve capability of relating theory and practical's together.

CO5: The practical's will support the students to understand concepts in theory clearly.

Govt. Holkar (Model Autonomous)Science College, Indore (M.P.) **Department of Botany**

Class B.Sc. III Year Botany

Title of the Paper(Course): Cell Biology Genetics and Biotechnology

Course Code- 304-II

Course Outcomes: After the completion of this course students will have understanding of

CO1: Deep conceptualization of cell and cell organelles is made easy to understand by students.

CO2: Importance of genetic Inheritance, cellular division and development is easily understood by the students which make them confident to conceptualize evolution adaptation and development

CO3: Recent knowledge of technologies related to improvement of genetic species gives students confidence to play role in field of agriculture & Biotechnology.

CO4: To discharge related technologies to the students in order to give them confidence regarding the course.

CO5: To achieve better teacher student relationship by making students understand the subject very well.

	ovt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Botany	
	Class- M.Sc. Ist Sem.	
]	Title of the Paper I: Biology & Diversity of Viruses, Bacteria and Fungi	
	Course Code: BO-11	
	Course out Comes	
CO1	Introduction to microbial world.	
CO2	To recognize the morphology, reproduction and life cycle patterns of Bacteria, Fungi and Cyanobacteria.	
CO3	Give understanding of infection cycle of microbes and fungi and their control measures.	
CO4	Collection of fungi, Bacteria, and Cyanobacteria from different localities, their diversification and familiarize with various ecological niche.	
CO5	Use of fungi in food and tool in industrial production.	

	Title of the Paper II: Biology & Diversity of Algae & Bryophytes	
	Course Code: BO-12	
	Course out Comes	
CO1	The students can learn the General characters of algae and Bryophyta, the	
	diverse habitat and it nature of thallus,	
CO2	Criteria of classification of algae, Economic importance of various Algae.	
CO3	The life cycle of Chlorophyta, Xanthophyta, Phaeophyta	
CO4	Rhodophyta can be understood by study of importance genera of these classes	
	of Algae.	
CO5	Similarity the general characters, Classification, types of reproduction and	
	alternation of generation of important members of bryophytes can be	
	understood by study its life cycle.	

Tit	Title of the Paper III: Biology & Diversity of Pteridophytes & Gymnosperms	
	Course Code: BO-13	
	Course out Comes	
CO1	General characters, Classification and life history of Pteridophytes.	
CO2	General account of different Pteridophytes.	
CO3	General account classification and life history and economic importance of Gymnosperms.	
CO4	General account of order Pentoxylales, Ginkgoales etc.	
CO5	Morphology structure and reproduction Gnetales.	

	Title of the Paper IV- Plant Ecology	
	Course Code: BO-14	
	Course out Comes	
CO1	Understand the concept of ecosystem.	
CO2	Learn about cycling of minerals in ecosystem.	
CO3	Know about ecological succession.	
CO4	Learn about concept of community.	
CO5	Learn about population ecology.	

	Class- M.Sc. IInd Sem.	
	Title of the Paper I: Plant Development & Reproduction	
	Course Code: BO-21	
	Course out Comes	
CO1	To study plant development, meristems, nodal anatomy.	
CO2	Study of primary and secondary anomalies.	
CO3	ABC model of flower development, Microsporogenesis.	
CO4	To study megasporogenesis and types of embryo sac.	
CO5	To study double fertilization, endosperm, embryo development.	

	Title of the Paper II: Morphology & Taxonomy of Angiosperms	
	Course Code: BO-22	
	Course out Comes	
CO1	They will fully understand the concepts of floral morphology.	
CO2	They will understand modern trends in Taxonomy	
CO3	They will be capable to identify diagnostic characters of major orders and families of	
	Angiosperms.	
CO4	The students will be able to prepare artificial key for plants	
CO5	They will learn teamwork which can be used plant conservation.	
	Title of the Paper III: Utilization & Conservation of Plant Resources	
	Course Code: BO-23	
	Course out Comes	
CO1	Students will get information about Natural Resources, their availability and use and also	
	about types of forest in the world.	
CO2	They can well understand the economic important of forest plants regarding their medicinal important and importance of non wood forest products like Gum plant, Fodder	
	plant etc.	
CO3	Different conservation practices for forest and natural resource conservation and its	
	information will understood.	
CO4	Students can make their carrier in forest and plant product and other related field like	
	aquatic habitat.	
CO5	The importance of Air, Water and Soil Pollution. Kinds, Resource, and effect of their	
	pollution on ecosystems, Climate changes sources, Greenhouse gases, Global warming,	
	and Ozone layer dip lection can be understood.	

Title of the Paper IV- Cell Biology		
Course Code: BO-24		
	Course out Comes	
CO1	Understand the structure of plant cell.	
CO2	Learn about various models and functioning of plasma membrane.	
CO3	Know about various cell organelles of plant cell'	
CO4	Understand chromosome structure and cell cycle.	
CO5	Know about breeding behavior in plants.	

	Class- M.Sc. IIIrd Sem.	
	Title of the Paper I: Plant Physiology	
	Course Code: BO-31	
Course out Comes		
CO1	Plant Physiology is a paper in M.Sc. classes to know the Physiological	
CO2	Phloem transport, loading and unloading. Proteins, phospholipids signaling	
CO3	Study of Plant growth regulator	
CO4	Study of Photoperiodism and Vernalization	
CO5	Students should learn stress physiology	

	e of the Paper II: Plant Biochemistry and Metabolism	
Course Code: BO-32		
	Course out Comes	
CO1	To Study different bio chemical and metabolic function of plants	
CO2	To learn about photosynthesis, photorespiration and its significance	
CO3	To learn about over view of respiration	
CO4	To learn about Lipid and Sulphate Metabolism Structure and function of lipids	
CO5	Study of Nitrogen Metabolism	

	Title of the Paper III-A Elective 1: Cytology and Genetics	
	Course Code: BO-33-A	
	Course out Comes	
CO1	Understand the structure of plant cell	
CO2	Learn about various models and functioning of plasma membrane.	
CO3	Know about various cell organelles of plant cell	
CO4	Understand chromosome structure and cell cycle	
CO5	To Study Mendel's laws of inheritance	

	Title of the Paper III-B Elective 1: Economic Botany	
	Course Code: BO-33-B	
	Course out Comes	
CO1	Study of Global warming and climate change	
CO2	To learn about medicinal plant of India and their uses	
CO3	To Study plants of economic importance - Vegetables, oil yielding plants, wild edible	
	plants, food crops, spices and condiments, Forage- fodder plants	
CO4	Study of Plant products and production	
CO5	To study organic farming and bio-fertilizers	

Title of the Paper IV -A Elective 2- Molecular Biology		
	Course Code: BO-44-A	
	Course out Comes	
CO1	Study of different types of DNA, RNA	
CO2	To learn about fine structure of genes	
CO3	Study of Protein synthesis	
CO4	To Study different Molecular techniques	
CO5	To Study Immuno techniques ELISA, FISH, GISH	

Tit	Title of the Paper IV -B Elective 2- Advance-Taxonomy, Embryology and Anatomy of	
	Angiosperms	
	Course Code: BO-44-B	
	Course out Comes	
CO1	To learn Modern systems of classification in the light of New Concepts of classification	
CO2	To study of evolution of Angiosperms Origin of Flower	
CO3	To study Tissues and Tissues systems	
CO4	To study Embryology and its prospects	
CO5	To study polyembryony embryo culture Seed and seed germination	

	Title of the Paper V Opern Elective Paper- Environmental Biology	
	Course Code: OE-EB	
	Course out Comes	
CO1	To study concept and scope of environmental biology	
CO2	To learn about Biogeochemical cycles.	
CO3	Concept of population: population growth forms	
CO4	To learn about Biodiversity	
CO5	To learn about different types of pollution and details	

	Govt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Botany	
	ar a sath a	
	Class- M.Sc. IV th Sem.	
	Title of the Paper I: Plant Cell, Tissue and Organ Culture	
	Course Code: BO-41	
	Course out Comes	
CO1	Plant tissue culture Introduction and scope.	
CO2	To study somatic embryogenesis	
CO3	To study protoplast culture and Somatic hybridization.	
CO4	To learn about Somoclonal variation and role of tissue culture	
CO5	To learn about Application of plant tissue culture	

	Title of the Paper II: Biotechnology and Genetic Engineering	
	Course Code: BO-42	
	Course out Comes	
CO1	To learn about biotechnology and its tools and techniques.	
CO2	Genetic transfer, DNA finger printing and PCR.	
CO3	Transgenic crops and ethical issues related to it.	
CO4	Use of Biotechnology in use and development of economically important microbes.	
CO5	To know about basic concepts of Bioinformatics.	

Title of the Paper III-A Elective -3: Plant Pathology		
	Course Code: BO-43-A	
	Course out Comes	
CO1	To study the various disease causing organisms on plants of economic importance and	
	their control.	
CO2	The phenomenon of infection, to study virulence and defense in hosts, concepts of	
	disease control.	
CO3	Study of some important plant diseases.	
CO4	Breeding for disease resistance	
CO5	Effect of environment on pathogenesis.	

	Title of the Paper III-B Elective -3: Plants & Society	
	Course Code: BO-43-B	
	Course out Comes	
CO1	The most important paper of M.Sc. classes for students is "Plant and Society" whole	
	syllabus is designed for entrepreneurship development of students.	
CO2	All the possible uses of plants for livelihood of humans are included in this course.	
CO3	Students can go in the field of Pharma, cosmetic and paper including after studying this	
	syllabus.	
CO4	They can also develop their own tissue culture lab, Bonsai garden, mushroom activation	
	unit.	
CO5	Production of medicinal plants, Floriculture and Nursery Management are another fields	
	of earning money.	

	Title of the Paper IV-A Elective -4: Industrial Microbiology	
	Course Code: BO-44-A	
	Course out Comes	
CO1	Basic techniques in microbiology - Microscopy, staining techniques, Culture, Nutrition and	
	growth of microorganisms	
CO2	Food Microbiology: Food spoilage, Food preservation methods, Microbiological production of	
	food such as fermented products	
CO3	Fermentation Industry: Selection of micro-organisms, Techniques and quality control, Production	
	of antibiotics, steroids, Human proteins, Vaccines and vitamins	
CO4	Microbial Growth-Environmental influences, Physical control, Chemical control &	
	Antibiotic controls	
CO5	Water quality in industry: Bacteriological safety of potable water, water quality analysis,	
	importance of BOD.	

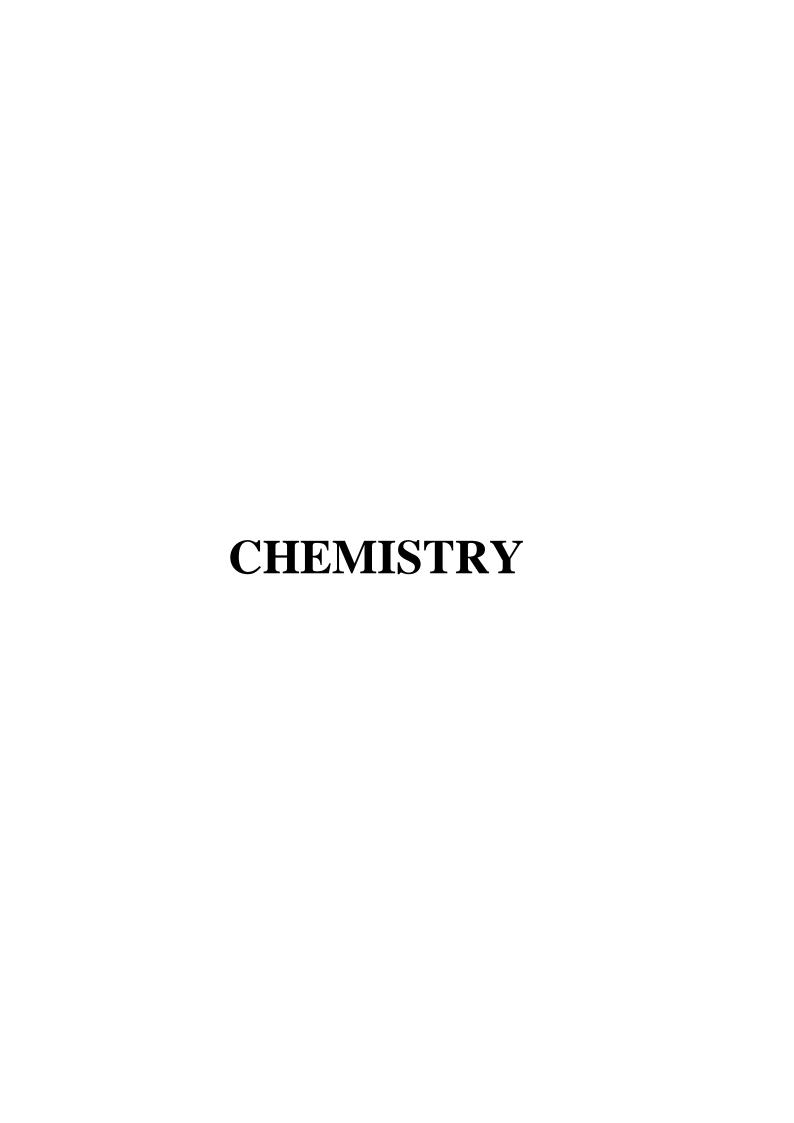
	Title of the Paper IV-B Elective -4: Pollution Ecology	
	Course Code: BO-44-B	
	Course out Comes	
CO1	The general concept of world environment and need to improve quality of environment	
	by understanding of various environmental problems.	
CO2	The aim is to understand the environmental problems of India with special reference to	
	Madhya Pradesh.	
CO3	The sources of Air, Soil, Water Pollution and steps to reduce the pollution of	
	environment.	
CO4	Nuclear pollution Pollution, to understand environmental laws	
CO5	Role of to have pollution control boards NGO'S and awareness about environmental	
	problems and means to control their.	

	Title of the Paper Elective -4: Applied Botany	
	Course Code: BO-44-C	
	Course out Comes	
CO1	Students will get information about entrepreneurship and Govt.	
CO2	Policies and various schemes and subsidies which helps in making carrier.	
CO3	Cultivation and marketing of floriculture and nursery development.	
CO4	Student will understood knowledge and information about organic farming, vermiculture, green manure and biofertilizer which help them in their future life.	
CO5	Student can make carrier in medicinal plants growing and business of auryedic.	

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Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of Chemistry	
	Class – B.Sc. – II nd YEAR	
Title of the	e Paper : Physical Chemistry Paper Code: 205-I	
	Course Objective	
Know the	Know the concept and application of classical thermo dynamic electrochemical and other physical phenomenon.	
	Course Learning Outcomes	
CO1	 Thermodynamics is a branch of physical chemistry that deals with heat, work and temperature and their relation to energy, radiation and physical properties of matter. Thermodynamics applies to a wide variety of topics in science and engineering, especially physical chemistry biochemistry, chemical engineering, mechanical engineering and meteorology. 	
C02	1. Phase rule is useful to metallurgists, materials engineers – Development of new alloys for special application.	

2. Fabrication of these alloys in to useful configuration.

	3. Design and control of heat treatment procedure for specific alloys.	
	These are many application of distribution law	
	(a) Solvent Extraction.	
	(b) Partition chromatography.	
	(c) Desilverisation of Lead.	
	(d) Determination of dissociation and association.	
C03	Explain electrolytic conduction and various types of conductance (molecular & equivalent). Describe kohlrausch law and transport numbers. Explain the functions of various electrode reactions.	
C04	Describe the functions various types of electrodes and also the knowledge of pH and Buffer solution and Henderson Hazal equation.	
C05	1. Surface chemistry plays an important role in industrial technologies for chemical and energy conversion, health care material and environment protection.	
	2. Used in syrups, paints, tooth paste, digestion of fats, pigment and dye.	
	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of Chemistry	
	Class – B.Sc. – II nd YEAR	
Title of the Pap	Title of the Paper : Inorganic Chemistry Paper Code: 205-II	
	Course Objective	
To introduce so	tudents, d & f block elements, coordination compounds, oxidation reduction and acid-base	
	Course Learning Outcomes	
CO1	The students will be able to explain characteristic properties of elements of first transition series & their compounds with stability & geometry.	
C02	Students will able to describe properties of 2 nd & 3 rd transition series elements and their comparative study with 1 st series elements.	
C03	The students will be able to explain fundamental concept of coordination chemistry, structure and bonding in coordination compounds, oxidation reduction & principles involved in extraction of metals.	
C04	The students will get complete understanding of f block elements & their properties.	
C05	The students will be able to classify the compounds into acid or base, using different concepts & will be familiar with reactions occurring in non aquous solvents.	



	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of Chemistry	
	Class – B.Sc. II nd YEAR	
Title of the I	Paper : Organic Chemistry Paper Code: 205-III	
	Course Objective	
	and the structure of molecules through spectroscopy, reaction mechanism, different roups, their properties, structure activity relationship. This is of great help in the industry.	
	Course Learning Outcomes	
CO1	To enable the students to know about Electromagnetic spectra, absorption and emainly UV and IR. UV and IR spectroscopy is a branch of organic chemistry which helps elucidation of organic molecules.	
C02	To help students to learn about the different types of alcohols and phenols and to know their preparation properties, structure and uses.	
C03	To help students to know about the different types of aldehydes and ketones and to learn about their preparation, properties, structure and uses.	
C04	To help students to know about the different types of carboxylic acids and to learn about their preparation, properties, structure and uses.	
C05	To help students to know about the different types of compounds of nitrogen like amino compounds, nitro compounds, azo compounds and to learn about their preparation, properties structure and uses.	

Govt. Holkar (Model, Autonomous) Science College, Indore			
	Department of Chemistry		
	Syllabus Session – 2021-2022		
	Class — B.Sc. — III rd YEAR		
Title of the Paper : Physical Chemistry Paper Code: 305-I			
	Course Objective		
In deep kr	In deep knowledge of various spectroscopy and it application and photo chemical processes.		
	Course Learning Outcomes		
CO1	Upon successful completion of this course, students able to apply the postulates of quantum mechanics and its application to molecular orbital theory.		
C02	Describe interaction of matter with electromagnetic radiation and identification of organic compounds.		
C03	Illustrate IR and Raman Spectrum for different molecules. Learn the electronic spectrum, Frank Condon principle, electronic excitation and Woodward Fieser rule.		
C04	After completing the course student should be able to explain theory and practice of common photochemical and photo physical methods.		
C05	The student know about physical properties (optical activity and dipole moment) and their contribution to molecular structure.		

	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of Chemistry	
	Syllabus Session – 2021-2022	
	Class — B.Sc. — III rd YEAR	
Title of the P	aper : Inorganic Chemistry Paper Code: 305-II	
	Course Objective	
metal – liga	ne students, the knowledge of inorganic polymers, Pearson's principle new theories of and bonding, stability of complexes, magnetic and spectroscopics properties and knowledge of organometallic chemistry and bioinorganic chemistry.	
	Course Learning Outcomes	
After successful completion of course students will be able to		
C01	Expand their knowledge about acids and bases as hard & soft and polymers, silicones and phosphazenes.	
C02	Understand different theories of metal ligand bonding and concept of stability in complexes.	
C03	Acquire knowledge of magnetic properties of complexes.	
C04	Interprete electronic spectra of complexes.	
C05	Understand the importance of essential and trace elements in biological functions and metal nitrosyl complexes.	

Govt. Holkar (Model, Autonomous) Science College, Indore		
Department of Chemistry		
	Syllabus Session – 2021-2022	
Class – B.Sc. III rd YEAR		
Title of the P	Title of the Paper : Organic Chemistry Paper Code: 305-III	
	Course Objective	
To develope student abilities and skills to acquire expertise over synthesis for chemical industries.		
Course Learning Outcomes		
CO1	Be able to determine the compound structure based on information generated from IR and NMR spectroscopy. Students will be able to interpret UV-visible spectroscopy.	
C02	To understand the most important classes of ligands found in organometallic compounds and students will be able to explain and predict the chemical behavior and reactivity.	
C03	Get knowledge about structure and functions of carbohydrates, Fat, oil and detergents.	
C04	Be able to understand structure, functions and classification of Amino acid, peptide, protein and Nucleic acid.	
C05	To know about heterocyclic compounds in different manner. i.e. Nomenclature , classification, preparation and chemical reactions.	

Govt. Holkar (Model, Autonomous) Science College, Indore		
Department of Chemistry		
	SYLLABUS SESSION	
	M.Sc. – I st SEMESTER	
Title of the Paper (Course): Inorganic Chemistry - I Course Code: CH-11		
Course Objective		
Inorganic chemistry deals with coordination chemistry, bioinorganic chemistry, electronic spectra f transition metals and reactions mechanism.		
This study is important for those who want to pursue career in science become and contribute to the society and our country.		
Course Learning Outcomes		
C01	To understand the trends in periodic properties and chemical bonding.	
C02	To understand the concept of stability of complex.	
C03	To familiarize the students with reaction mechanism of transition of transition	
	metal complexes.	
C04	To know the nature of metal ligand bonding in co-ordination compounds and	
	bonding parameters.	
C05	To understand the acid & basic nature of substances.	

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Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Chemis	try
M.Sc. – I st SEMESTER	२
Title of the Paper (Course) : Organic Chemistry – I	Course Code: CH-12
Course Objective	

This course aims to impart to the student, knowledge of Basic concept of bonding, structures, resonance, aromaticity, hyper-conjugation and tautomerism in organic molecules. Organic molecules generation, structure, stability and reactivity of reactive intermediates. Classification of reactions with mechanism, determining reaction mechanism using suitable methods.

Course Outcomes	
C01	To understand chemical bonding & reactivity, various effects in organic molecules.
C02	To understand concept of stereochemistry & will be able to understand stereo chemical aspects in organic chemistry.
C03	To understand the stability of different isomers by taking into account the spatial orientation and through space interactions of substituent.
C04	To understand various reactions, rearrangement mechanism & their applications.
C05	To develop knowledge of substitution addition & elimination reactions.

Govt. Holkar (Model, Autonomous) Science College, Indore			
Department of Chemistry			
	SYLLABUS SESSION :		
	M.Sc. – 1 st SEMESTER		
Title of the I	Paper (Course): Physical Chemistry – I, Course Code: CH-13		
	Course Objective		
	and develop the principles those are used to explain and interpret many of physical al observations.		
To explain many of proposed hypothesis in terms of fundamental concepts.			
Part B: Co	Part B: Content of the Course:		
	Course Learning Outcomes		
C01	Upon successful completion of this course, students will be able to apply the postulates of quantum mechanics and understand the quantum chemistry of free electron and hydrogen atom.		
C02	Different principles and applications of perturbation theory and study of Huckel theory.		
C03	Applications of Angular momentum, Eigen values and Eigen functions on particular system.		
C04	Use of fugacity and activity in electrolytic solutions.		
C05	Study of statistical thermodynamics in distribution of particles using different statistics.		

Govt. Holkar (Model, Autonomous) Science College, Indore			
Department of Chemistry			
	SYLLABUS SESSION :		
	M.Sc. – I st SEMESTER		
Title of th	Title of the Paper (Course): Group Theory and Spectroscopy-I Course Code: CH-14		
	Course Objective		
Group Th	Group Theory is one of the great simplifying and unifying ideas in modern mathematics.		
It plays a role in our understanding of fundamental particles, the structure of crystal lattices and the geometry of molecules.			
Spectroscopy is used in physical and analytical chemistry because atoms and molecular have unique spectra.			
As a result these spectra can be used to detect identify and quantify information about the atoms and molecules.			
Spectroscopy is also used in astronomy and remote sensing an earth.			
Course Outcomes			
C01	After studying this course students should be able to explain what is meant by a symmetry of a plane figure.		
C02	Describe interaction of matter with electromagnetic radiation.		
C03	Structure determination & identification of organic compounds		
C04	Compare result of IR & Raman Spectrum.		
C05	Illustrate IR & Raman Spectrum for different molecules.		

Govt. Holkar (Model, Autonomous) Science College, Indore			
	Department of Chemistry		
	SYLLABUS SESSION :		
	M.Sc. – II nd SEMESTER		
Title of the	Title of the Paper (Course) : Inorganic Chemistry - II Course Code: CH-21		
	Course Objective		
To impart t	the knowledge of electronic spectra, magnetic & optical properties of transition metal		
complexes and to study the metal π complexes $\&$ metal clusters.			
	Course Outcomes		
C01	To understand the fundamental requirement interpretation of electronic spectra of		
	metal complexes and prediction of their properties.		
C02	To describe the magnetic properties of transition metal complexes.		
C03	Describe the study of metal carbonyl metal nytrocycles, their preparation, properties		
	and structure.		
C04	To explain the classification of metal clusters & their structures.		
C05	To study in detail the optical properties of complexes.		

Govt. Holkar (Model, Autonomous) Science College, Indore			
Department of Chemistry			
	SYLLABUS SESSION :		
	M.Sc. – II nd SEMESTER		
Title of the	e Paper (Course) : Organic Chemistry- II Course Code: CH-22		
	Course Objectives		
	To impart knowledge of mechanisms of substitution, addition, elimination, free radical reaction, pericyclic reaction and some named reactions in organic chemistry		
	Course Outcomes		
C01	The student will acquire knowledge of mechanistic aspects in nucleophilic & electrophilic substitution.		
C02	Types of free radical reaction and different name reactions.		
C03	Mechanistic & stereo-chemical aspects of addition reactions.		
C04	Mechanism of some name reactions with special reference to addition to carbon- Hetero multiple bonds		
C05	To identify and classify pericyclic reaction to explain importance of molecular orbitals in pericyclic reaction, electronic counting, prediction of reaction, the type of product in pericyclic reaction etc.		

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Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of Chemistry	
	SYLLABUS SESSION :	
	M.Sc. – II nd SEMESTER	
Title of the	Paper (Course): Physical Chemistry – II Course Code: CH-23	
	Course Objective	
To impact of	correctness and depth of conceptual arguments in physical chemistry.	
	Course Outcomes	
CO1	To elucidate the use of chemical kinetics in understanding the reaction mechanism and	
	to apply the theories of unimolecular reaction. Concepts of homogeneous and	
	heterogenous catalysis.	
CO2	This course is introduction to surface chemistry and are overview of methods for the	
	characterization of surface, estimation of surface area (BET equation) know about the	
	shape and composition of micelle produced by various kinds of surfactants, CMC.	
CO3	At the end of course the student acquired knowledge of kinetics and mechanism of	
	polymerization and experimental methods for molecular weight characterization.	
C04	Thermodynamics of natural processes and energy transformations in irreversible	
	thermodynamics, concept of entropy and forces and fluxes.	
C05	Evaluate fundamentals of electrochemistry. To know the structure of electrode surface	
	and application of electrode process.	



Govt. Holkar (Model, Autonomous) Science College, Indore
Department of Chemistry
SYLLABUS SESSION :
M.Sc. – II nd SEMESTER

Title of the Paper (Course): Spectroscopy – II and Diffraction Method

Course Code:CH-24

Course Objective:

Group Theory is one of the great simplifying and unifying ideas in modern mathematics.

It was introduced in order to understand the solution to polynomial equations but only in the last one hundred year has its. Full significance as a mathematical formulation of symmetry been understood.

It plays a role in our understanding of fundamental particles, the structure of crystal lattices and the geometry of molecules.

Spectroscopy is used in physical and analytical chemistry because atoms and molecular have unique spectra.

As a result these spectra can be used to detect identify and quantify information about the atoms and molecules.

Spectroscopy is also used in astronomy and remote sensing an earth.

It is very useful to understand how an object like a black hole, neutron star, active galaxy produces light, how fast it is moving and what elements it is composed of.

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	Course Outcomes		
C01	NMR spectroscopy used to determine the structure of organic molecules in solution		
	and study molecular physics and crystals as well as non crystalline materials		
C02	NQR spectroscopy provide detailed information on the structure and conformation of		
	biologically active system determination of the electronic structure of the molecule.		
C03	ESR spectroscopy is used in various branches of science such as biology chemistry and		
	physics for the detection and identification of free radicals in the solid, liquid or gaseous		
	state.		
C04	The most familiar use of x-rays is checking for fractures, chest x-rays can spot		
	pneumonia, mammograms use for breast cancer.		
C05	Electron diffraction and neutron diffraction used for crystal structure analysis of		
	unknown malarial.		

Govt. Holkar (Model, Autonomous) Science College, Indore			
Department of Chemistry			
SYLLABUS SESSION :			
M.Sc. – III rd SEMESTER			
Title of the Paper (Course): Application of Spectroscopy – I Course Code: CH-31			
Course Objective			
Spectroscopy is used in physical and analytical chemistry because atoms and molecular have unique spectra.			
As a result these spectra can be used to detect identify and quantify information about the atoms and molecules.			
Spectroscopy is also used in astronomy and remote sensing an earth.			
It is very useful to understand how an object like a black hole, neutron star, active galaxy produces light, how fast it is moving and what elements it is composed of.			
Course Outcomes			
C01	Students will be able to interpret electronic spectra of transition metal complexes with the application of magnetic and spectral properties.		
C02	Vibrational spectroscopy help to determine the structure bond length force constant of molecules.		
C03	NMR spectroscopy used to determine the structure of organic compounds and in the field of medical science (MRI)		
C04	Identification of unknown samples crystalline & non crystalline material		
C05	The technique of Mossbaur spectroscopy is widely used in mineralogy to examine the valence state of Iron. This technique give information in many areas such as physics, chemistry, biology and metallurgy.		

Govt. Holkar (Model, Autonomous) Science College, Indore			
Department of Chemistry			
SYLLABUS SESSION :			
M.Sc. – III rd SEMESTER			
Title of the Paper (Course): Photo Chemistry Course Code: Cl			
Course Objective			
To explain the concept of photo chemistry and study Beer-Lamberts Law.			
To describe and explain photochemical and photo physical process using Jablonski-diagram, their quantum field.			
Course Outcomes			
CO1	After completing the course they should be able to explain theory and practice of common photochemical & photo physical methods		
CO2	Describe the interaction of excited states with their surroundings and apply theoretical methods for treating excited states.		
CO3	Describe photo inducedprocesses in semiconductors and explain how there can be used for photo physicalenergy conversion.		
CO4	Explain theory and application of photo catalysis and explain the environmental impact of atmospheric photochemistry.		
CO5	They should know the importance of singlet molecular oxygen in photochemical reactions & in synthesis of some biologically active compounds. Describe and distinguish between radioactiveand non-radioactive transitions with the help of Jablonski-diagram		

Gout Holker (Model Autonomous) Science College Indore			
	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of Chemistry		
SYLLABUS SESSION :			
	M.Sc. – 3 rd SEMESTER		
Title of the	Title of the Paper (Course): Environmental Chemistry Course Code: CH-33		
	Course Objective		
The main aim of the course is to equip students with the knowledge of the chemical properties of elements and compounds as well as about the chemical reaction essential for the emergence and existence of the cycling and accumulation of pollutants in the environment.			
	Course Outcomes		
CO1	Upon successful completion of the course the student will be able to demonstrate knowledge of chemical & biochemical principles of fundamental environmental processes in air, water & soil.		
CO2	Recognize different types of toxic substances and responses and analyzetoxicological information.		
CO3	Apply basic chemical concepts to analyze chemical processes involved in different environmental problem.		
CO4	Describe water purification and waste treatment processes. Describe causes and effects of environmental pollution by energy industry and discuss some mitigation strategies.		
CO5	Explain energy crises and different aspects of sustainability. Discuss local & global environmental issues based on the knowledge gained throughout the course.		

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	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of Chemistry	
SYLLABUS SESSION :		
M.Sc. – III rd SEMESTER		
Title of the Paper (Course): Polymer Chemistry Course Code: CH-34-A		
Course Objective		
Polymer permeates energy aspects of daily life and it is difficult to imagine society without synthetic and natural polymers.		
	Course Outcomes	
CO1	At the end of the course students will be able to understand different kinds of polymers & their properties.	
CO2	Concept of molecular weight and distribution	
CO3	Analysis testing of polymers i.e. Chemical Analysis, Thermal Analysis etc.	
CO4	Structure, Properties & Applications of Inorganic Polymers i.e. Silicone, phosphorous, Boron etc.	
CO5	Knowledge of complex polymer & their applications.	

	Govt. Holkar (Model, Autonomous) Science College, Indore	
Department of Chemistry		
SYLLABUS SESSION :		
M.Sc. – III rd SEMESTER		
Title of the Paper (Course): Organo-transition Chemistry Course Code: CH-34-B		
	Course Objective	
Organometallic compounds are industrial chemical reactions as well as in the reactions, where target molecules include polymers and pharmaceutical		
	Course Outcomes	
CO1	Learning outcome has a good overview of the fundamental principles of organotransition metal. Chemistry and know how chemical properties are affected by metals and ligands.	
CO2	Upon successful completion students will have the knowledge & skills to explain the synthesis structure, bonding, properties and reactivity of main group reagent.	
CO3	To learn organotransition metal chemistry and cluster chemistry.	
CO4	Know important applications of organometallic homogeneous catalysis in the production of large scale and smaller scale production of complexes.	
C05	Its application is also used for understanding of the mechanistic features and structural diversities of complexes with the help of fluxinality.	

	Govt. Holkar (Model, Autonomous) Science College, Indore		
Department of Chemistry			
SYLLABUS SESSION :			
	M.Sc. – III rd SEMESTER (Open Elective)		
Title of the	Title of the Paper (Course): Health Chemistry Course Code: OE-HC		
	Course Objective		
To enable	the students about the role of chemistry of food and to learn about bio-molecule.		
	the students about the role of common drugs and their chemistry		
To enable the students to learn the importance of blood and its biology including respiration and electrolytes.			
Unit no 4	enable students to learn about the enzymes and hormones involved in digestion.		
	the students learn about the common diseases caused by food, life style, deficiency s and contamination and infections		
	Course Outcomes		
CO1	After completion of the course students will be able to organize their dietary habits.		
CO2	The students will be able to identify the drugs used in diseases and the doctor's prescriptions.		
CO3	The students will be able to maintain the health through the knowledge of blood chemistry.		
CO4	The students will be able to maintain the digestive health through the knowledge of enzymes & hormones.		
C05	The students will be able to prevent common contagious diseases, lifestyle and food born diseases through the knowledge of this unit.		

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of Chemistry		
SYLLABUS SESSION :			
	M.Sc. – IV th SEMESTER		
Title of th	ne Paper (Course) : Application of Spectroscopy – II Course Code: CH-41		
	Course Objective		
Spectroscopy is used in physical and analytical chemistry because atoms and molecular have unique spectra.			
	As a result these spectra can be used to detect identify and quantify information about the atoms and molecules.		
Spectros	copy is also used in astronomy and remote sensing an earth.		
	It is very useful to understand how an object like a black hole, neutron star, active galaxy produces light, how fast it is moving and what elements it is composed of.		
	Course Outcomes		
C01	UV- visible spectroscopy is used in analytical chemistry for the quantitative determination of different analytes such as transition metal ions; highly conjugated organic compounds and biological macromolecular.		
C02	IR spectroscopic analysis is used to determine the various chemical functional group present in the sample.		
C03	Elucidate chemical structure of organic molecules.		
C04	NMR spectroscopy is widely used to determine the structure of organic molecules in solution and study molecular physics and crystals as well as non crystalline materials.		
C05	Mass spectrometry is an analytical tool useful for measuring the mass to charge ration (m/z) of one or more molecules present in a sample and used to Identify unknown compounds.		

Govt. Holkar (Model, Autonomous) Science College, Indore			
Department of Chemistry			
	SYLLABUS SESSION :		
	Class – M.Sc. – 4 th SEMESTER		
Title of the	Title of the Paper (Course) : Solid State Chemistry Course Code: CH-42		
	Course Objective		
To provide	an introduction to the concept underlying solid state chemistry		
To illustrate	e the mid-range of materials and physical properties that currently available.		
	Course Outcomes		
CO1	On completion of the course the students should be able to describe the principles		
	concerning solid state structure.		
CO2	The students should be able to describe experimental procedures and co-		
	precipitation as a precursor to solid state reactions.		
CO3	To describe different types of crystal defects and Non-Stoichiometry.		
CO4	To describe electrically conducting solids and new super conductors.		
CO5	They learn type of liquid crystals and various theories of liquid crystals.		

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of Chemistry		
SYLLABUS SESSION :			
	M.Sc. – IV th SEMESTER		
Title of the	Paper (Course): Biochemistry Course Code: CH-43		
	Course Objective		
To know the	e application of co-ordination compounds in living systems.		
To understa	and the chemistry of biomolecules.		
To understa	and the importance of metabolism of substrates.		
To know the	e interpretation of data emanating from a clinical test tube.		
	and the basic principles of protein and polysaccharide structure.		
	Course Outcomes		
CO1	Students will learn about Bulk and Trace metals and Na+ / K+ Pump and their importance in biological system.		
CO2	To understand the knowledge of transport and storage of dioxygen, structure and functions of Haemoglobin and Chlorophyll.		
CO3	To get knowledge about mechanism of enzyme action, classification of enzymes and factors affecting enzyme action.		
C04	Detailed study about Coenzyme chemistry, different enzyme models and Biotechnological Applications of Enzyme.		
C05	Students get Brief study about Biological cell structure, Bioenergetics, forces involved in biopolymer interactions, structure and functions of cell membrane and transport of lons.		

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of Chemistry		
	SYLLABUS SESSION :		
	M.Sc. – IV th SEMESTER		
Title of the	Title of the Paper (Course): Analytical Chemistry Course Code: CH-44-A		
	Course Objective		
Analytical chemistry is the branch of science that provides knowledge of compound separation, identification and quantification that can be useful for measuring by availability of drugs.			
It plays in monitoring	It plays important role as drug manufacturing process control in industry and environmental monitoring.		
	Course Outcomes		
CO1	The student will be able to explain the fundamentals of analytical chemistry and steps of characteristics analysis.		
CO2	Express the role of analytical chemistry in science.		
CO3	Compares qualitative and quantitative analysis methods.		
CO4	Will be able to evaluate the analytical data in terms of statistics such as mean, median,		
	precision, accuracy, absolute error, relative error and the error sources.		
CO5	Role of analytical chemistry in food analysis, water pollution and analysis of soil &		
	fuel, clinical chemistry and drug analysis.		

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of Chemistry		
	SYLLABUS SESSION :		
	Class – M.Sc. – 4 th SEMESTER		
Title of the	Title of the Paper (Course): Medicinal Chemistry Course Code: CH-44-B		
	Course Objective		
Medicinal Chemistry is the branch of chemistry that is related with synthesis, structure and its activity in the human body. It also signifies the structure activity relationship i.e. by changing the structure of the drug how its activity is altered.			
Different generations of drug are uses as microorganisms become immune with time, thus necessity of active new drug becomes prominent.			
The exact	structure of the drug and the functional units present in it is clarified.		
	Course Outcomes		
CO1	The basic knowledge of structure and its relation with its actively with the help of different theories is very important.		
CO2	The study of enzymatic reactions and sulphur drugs help to know its effect on human body and mode of action.		
CO3	The structure, synthesis of antibiotics helps to understand their effect on certain specific microorganisms.		
CO4	Study of anti fungal and anti malarial drugs provide knowledge of their chemo therapeutic effect.		
C05	Study of different classes of drug give information about their therapeutic uses.		

COMPUTER SCIENCE

	Govt. Holkar (Model.Autnomous) Science College ,Indore
	Department of Computer Science
	 Class-B.sc I year
	Title of the Paper(Course) Fundamentals of Computer
	Course Code 106-I
	Objective : To make the Student able to identify the components of a personal computer and introduces the concepts of computer basics with particular attention to working of system.
O	n completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.
	Course out Comes
CO1	General Knowledge of Basic Computer and Window Basics (Manage Files & folders).
CO2	MS-Office, Deigning Database, Tabulation, data representation etc.
CO3	Knowledge of Number System, Gates, use in Traffics Signals, make Electronics Items, etc.
CO4	Use of Memory in every Electronics Device and use of different types Microprocessor
CO5	Knowledge of CPU and its working

	Govt. Holkar (Model.Autnomous) Science College ,Indore Department of Computer Science	
	Department of Computer Science	
	Class-B.sc IIyear	
	Title of the Paper(Course): DATA STRUCTURE Using C++	
	Course Code 106-I	
conce	se Objective - To understand concepts about searching and sorting techniques & basic opts about stacks, queues, lists, trees, graphs and about writing algorithms and step by approach in solving problems with the help of fundamental data structures	
On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
CO1	Understanding of computer system.	
	Understanding of computer system. Course out Comes	
CO2	Understanding of computer system. Course out Comes Introduction to stack ,stack application ,introduction to queues ,applications of queue .	
CO1 CO2 CO3 CO4	Understanding of computer system. Course out Comes Introduction to stack ,stack application ,introduction to queues ,applications of queue . Introduction to linked list, dynamic m/r allocation	

Class-B.sc IIIyear

Title of the Paper(Course) DataBase Management System

Course Code

<u>Course Objective</u> The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.

CO1 Demonstrate the basic elements of a relational database management system. CO2 Identify the data models for relevant problems. CO3 Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data. CO4 Demonstrate their understanding of key notions of query evaluation and optimization techniques. CO5 Extend normalization for the development of application software's.

	Govt. Holkar (Model.Autnomous) Science College ,Indore	
	Department of Computer Science	
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	Class-B.sc I year	
	Title of the Paper(Course) - Programming in C Language	
	Course Code 106 -II	
programi	ming language, so that the students will have a basic concept for understanding and using other ming language. mpletion of the course, the student is expected to be able to: Knowledge and Understanding of	
	computer system.	
	Course out Comes	
CO1	General Knowledge of Programming types, Problem solving concepts, usage of Algorithm/ Flowchart .Writting, compiling and debugging programs in C language	
CO2	students will learn how to design structure of c programs, using tokens	
CO3	Formatted and unformatted I/O ,control statement and Looping.Design programs containing decision structures.	
CO4	Array(1-d,2-d), Functions & Recursion, Pointer and structure,	
CO5	File handling and Program design in Graphics and bit of animation	

	Govt. Holkar (Model.Autnomous) Science College ,Indore		
	Department of Computer Science		
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	Class-B.sc IIyear		
	Title of the Paper(Course) Object oriented programming Using C++		
	Course Code 106-I		
	Objective C++ Programming is intended for software engineers, systems		
	program managers and user support personnel who wish to learn the C++ ming language.		
On	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	Course out Comes		
CO1	Introduction to C++, key concepts of object oriented programming, unformatted & formatted console I/O oprations.		
CO2	parts of C++ program, tokens, oprators, Control structures.		
CO3	Functions, function overloading, demonstration of Classes and objects, implementing abstraction using access specifiers.		
CO4	Operator overloading, reusing code through Inheritance and its types.		
CO5	Pointer & Arrays of classes, implementing Polymorphism, Template, Handling Exceptions		

	Govt. Holkar (Model.Autnomous) Science College ,Indore	
	Department of Computer Science	
	Class-B.sc IIIyear	
	Title of the Paper(Course) Operating System	
	Course Code	
sys- te	bjective : A successful student will be able to understand the basic components of a computer operating sys- tem, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.	
	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
1	on and evoluation of Operating system along with various types.	
2	CPU time using scheduling algorithm for processors	
3	ge replacement policies for dynamic memory management	
4	d construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems, Deadlock prevention and avoidance.	
5	with linux OS. Introduction to various linux commands and vi editor etc.	

Govt. Holkar (Model.Autnomous) Science College ,Indore		
Department of Computer Science		
	Class-B.C.A I semester	
	Title of the Paper(Course) Programming & Problem solving through C -I	
	Course Code – 5	
<u>Course Objective:</u> The course will stress on fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.		
On	completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	General Knowledge of Programming types, Problem solving concepts, usage of Algorithm/ Flowchart .Writting, compiling and debugging programs in C language	
CO2	students will learn how to design structure of c programs, using tokens	
CO3	Formatted and unformatted I/O ,control statement and Looping.Design programs containing decision structures.	
CO4	Array(1-d,2-d), Functions & Recursion, string handeling.	
CO5	structure,preprocessor directives(macros).	

	Govt. Holkar (Model.Autnomous) Science College ,Indore		
	Department of Computer Science		
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	Class-B.C.A I semester		
	Title of the Paper(Course) PC- Software		
	Course Code - 5		
	<u>Course Objective</u> :-This course examines the interaction between information and methods of communication technology.		
On com	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	Course out Comes		
CO1	Describe the usage of computers and why computers are essential components in business and society		
CO2	Documentation using MS-word		
CO3	Electronic Spread sheet using MS- Excel		
CO4	Database management using MS- Access		
CO5	Presentation using MS- Powerpoint.		

	Govt. Holkar (Model.Autnomous) Science College ,Indore		
	Department of Computer Science		
	Class-B.C.A II semester		
	Title of the Paper(Course) Introduction to Information System		
	Course Code - 105		
	<u>Course Objective</u> To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.		
On con	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	Course out Comes		
CO1	The role of computer in information systems		
CO2	What are the characteristic and element of information system		
CO3	What are the various types of information system and models		
CO4	What are the different types of specialised information system		
CO5	Hands on E-Commerce		

	Govt. Holkar (Model.Autnomous) Science College ,Indore		
	Department of Computer Science		
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	Class-B.C.A II semester		
	Title of the Paper(Course) Operating System Fundamentals		
	Course Code - 105		
operatin introduc	<u>Course Objective</u> :-A successful student will be able to understand the basic components of a computer operating sys- tem, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.		
On c	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	Course out Comes		
CO1	Understand the basic working process of an operating system		
CO2	Schedule CPU time using scheduling algorithm for processors		
CO3	Apply page replacement policies for dynamic memory management		
CO4	Design and construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems, Deadlock prevention and avoidance.		

Understand the issues in synchronization and memory management

CO5

Govt. Holkar (Model.Autnomous) Science College ,Indore		
Department of Computer Science		
	Class-B.C.A III semester	
	Title of the Paper(Course) Discrete mathmetics	
	Course Code -	
Course	<u>Course Objective</u> : The student will be able to use logical notation and Perform logical proofs.	
On co	mpletion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	Be able to reason at multiple levels of detail and abstraction, being aware, in particular, of the applicability and limitations of tools from mathematics and theoretical computer science	
CO2	Recognize the context in which a computer system may function, including its interactions with people and the physical world.	
CO3	Able to communicate with, and learn from, experts from different domains throughout their careers	
CO4	Possess a solid foundation that allows and encourages them to maintain relevant skills as the field evolves	
CO5	To be able to manage their own career development and advancement	

Govt. Holkar (Model.Autnomous) Science College ,Indore			
	Department of Computer Science		
	Class-B.C.A III semester		
	Title of the Paper(Course) Data structure using c		
	Course Code -		
& bas	e <u>Objective</u> :-To understand concepts about searching and sorting techniques ic concepts about stacks, queues, lists, trees, graphs and about writing algorithms and step by step ch in solving problems with the help of fundamental data structures.		
On	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	Course out Comes		
CO1	Introduction to C, key concepts of object oriented programming, unformatted & formatted console I/O oprations.		
CO2	parts of C program, tokens, oprators, Control structures.		
CO3	Functions, function overloading, demonstration of Classes and objects, implementing abstraction using access specifiers.		
CO4	Operator overloading, reusing code through Inheritance and its types.		

Pointer & Arrays of classes, implementing Polymorphism, Template, Handling Exceptions

CO5

	Govt. Holkar (Model.Autnomous) Science College ,Indore
	Department of Computer Science
	Class-B.C.A III semester
	Title of the Paper(Course) object oriented programming using c++
	Course Code -
and user	Objective:-C++ Programming is intended for software engineers, systems analysts, program managers support personnel who wish to learn the C++ programming language.
On com	repletion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.
	Course out Comes
CO1	Introduction to stack ,stack application ,introduction to queues ,applicatons of queue .
CO2	Introduction to linked list, dynamic m/r allocation
CO3	Concept of non-linear data structure, Tree-basic terminology, Applications of binary tree
CO4	Searching and sorting techniques, analysis of various searching and sorting algorithms, algorithm design.
CO5	Introduction to Graphs, graph traversal, shortest path algorithm, hashing

	Coxt. Hollzer (Model Autnomous) Science College Indore		
	Govt. Holkar (Model.Autnomous) Science College ,Indore Department of Computer Science		
	Department of Computer Science		
	Class-B.C.A III semester		
	Title of the Paper(Course) unix operating system		
	Course Code -		
and man	<u>Objective</u> :-The student should be able to: Identify and use UNIX/Linux utilities to create age simple file processing operations, organize directory structures with appropriate and develop shell scripts to perform more complex tasks.		
On com	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	Course out Comes		
CO1	Learn UNIX structure, commands, and utilities		
CO2	Describe and understand the UNIX file system		
CO3	Write shell scripts in order to perform shell programming		
CO4	Acquire knowledge about text processing utilities, process management and system operation of UNIX.		

Installation of softwares and hardwares on unix operating system

CO5

Govt. Holkar (Model.Autnomous) Science College ,Indore			
	Department of Computer Science		
	Class-B.C.A III semester		
	Title of the Paper(Course) accounting and financial management		
	Course Code -		
Course Objective			
On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.			
	Course out Comes		
CO1	Demonstrate the role of accounting in business in economic world.		
CO2	Explain the principles of accounting and book keeping		
CO3	Apply accounting rules in determining financial results and preparation of financial statement		
CO4	Rectify errors caused during preparation of Final accounts.		
CO5	Use software in preparation of Financial Statements		

	Govt. Holkar (Model.Autnomous) Science College ,Indore
	Department of Computer Science
	Class-B.C.A IV semester
	Title of the Paper(Course) Computer Oriented Numerical Methods
	Course Code
Course	e Objective
On cor	mpletion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.
	<u>Course out Comes</u>
CO1	To develop the mathematical skills of the students in the areas of numerical methods.
CO2	To teach theory and applications of numerical methods in a large number of engineering su require solutions of linear systems
CO3	finding Eigen values, eigenvectors, interpolation and applications, solving ODEs, PDEs.
CO4	To lay foundation of computational mathematics for post-graduate courses specialized studies and research.
CO5	Dealing with statistical problems like testing of hypotheses.
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Govt. Holkar (Model.Autnomous) Science College ,Indore		
Department of Computer Science		
	Class-B.C.A III semester	
	Title of the Paper(Course) communication skill	
	Course Code -	
	se Objective :-Students will develop knowledge, skills, and judgment around human communication that atte their ability to work collaboratively with others	
On co	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	Students will be able to understand and apply knowledge of human communication and language processes as they occur across various contexts, e.g., interpersonal, intrapersonal, small group, organizational, media, gender, family, intercultural communication, technologically mediated communication, etc. from multiple perspectives.	
CO2	Presentation skills training courses provide strategies to plan, structure and deliver powerful presentations. Learn how to structure presentations in order to deliver effective messages as well as receive the coaching to dramatically improve your personal presentation. This specific program is one of the leading presentation skills training courses developed to help people engage audiences	
CO3	A group discussion among students is being organized to see and evaluate their thinking skills, listening abilities and how they are communicating their thoughts. One should learn to control the conversation through listening attentively and then having the perseverance to mould it towards his/her own direction.	
CO4	Develop, exhibit and accurate sense of self and nurture a deep understanding of personal motivation. Develop an understanding of and practice personal and professional responsibility.	
CO5	To practice and develop writing processes pertaining to invention, revision, organization, drafting through multiple drafts, editing, and adjusting for rhetorical context (purpose, audience, persona)	

Class-B.C.A III semester Title of the Paper(Course) software engineering Course Code -Course Objective: - To provide the idea of decomposing the given problem into Analysis, Desing, Implementation, Testing and Maintenance phases. To gain the knowledge of how Analysis, Design, Implementation, Testing and Maintenance processes are conducted in a software project. On completion of the course, the student is expected to be able to: Knowledge and Understanding of computer system. **Course out Comes** CO₁ Understand the importance of the stages in the software life cycle. CO₂ Understand the various process models CO₃ Be able to design software by applying the software engineering principles CO4 To understand important concepts of software engineering and project management. CO5 introduction of management information system

	Govt. Holkar (Model.Autnomous) Science College ,Indore	
	Department of Computer Science	
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	Class-B.C.A IV semester	
	Title of the Paper(Course) DataBase Management System	
	Course Code	
managen	<u>Course Objective</u> :-The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.	
On com	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	Demonstrate the basic elements of a relational database management system.	
CO2	Identify the data models for relevant problems.	
CO3	Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data.	
CO4	Demonstrate their understanding of key notions of query evaluation and optimization techniques.	
CO5	Extend normalization for the development of application software's.	

	Department of Computer Science	
	Class-B.C.A IV semester	
	Title of the Paper(Course) Programming with java	
	Course Code	
compi	se Objective: The student should be able to: Use an integrated development environment to write, ile, run, and test simple object-oriented Java programs. Read and make elementary modifications to programs that solve real-world problems.	
O	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	The students will have the competence in the use of Java Programming language	
CO2	The development of small to medium sized application programs that demonstrate professionally acceptable coding.	
CO3	An understanding of the principles and practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements.	
CO4	Design and implement an application that demonstrates their competency with Java syntax, structure and programming logic, incorporating basic features of the language as well as some features from the I/O (Input/Output) or GUI libraries	
CO5	Competence in the use of Java Programming language in the development of small to medium sized application programs that demonstrate professionally acceptable coding and performance standards.	

	Department of Computer Science		
	Class-B.C.A IV semester		
	Title of the Paper(Course) environment awarness and green computing		
	Course Code		
<u>Course Objective</u> :-The goals of green computing are similar to green chemistry: reduce the use of hazardous materials, maximize energy efficiency during the product's lifetime, the recyclability or biodegradability of defunct products and factory waste			
On co	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	Course out Comes		
CO1	Understand the concept of green IT and relate it to sustainable development		
CO2	Apply the green computing practices to save energy.		
CO3	Discuss how the choice of hardware and software can facilitate a more sustainable operation.		
CO4	Use methods and tools to measure energy consumption		
CO5	Understand benefits of renewable and sustainable energy systems.		

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	Department of Computer Science	
	Class-B.C.A V semester	
	Title of the Paper(Course) Computer Network	
	Course Code	
imple and g	<u>Course Objective</u> :-The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.	
On c	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	Explain the importance of data communications and the Internet in supporting business Communications and daily activities.	
CO2	Analyze the services and features of the various layers of data networks.	
СОЗ	Explain how communication works in data networks and the Internet.	
CO4	Recognize the different internetworking devices and their functions.	
CO5	Explain the role of protocols in networking.	

	Department of Computer Science	
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	Class-B.C.A V semester	
	Title of the Paper(Course) Introduction to cloud computing	
	Course Code	
<u>Course Objective</u> :-Understand the importance of virtualization in distributed computing and how this has enabled the development of Cloud Computing, Analyze the performance of Cloud Computing, the concept of Cloud Security, learn the Concept of Cloud Infrastructure Model.		
On completion of the course, the student is expected to be able to : Knowledge and Understanding		
	of computer system.	
Course out Comes		
CO1	The fundamental ideas behind Cloud Computing, the evolution of the paradigm, its applicability; benefits, as well as current and future challenges;	
CO2	The basic ideas and principles in data center design; cloud management techniques and cloud software deployment considerations;	
CO3	Different CPU, memory and I/O virtualization techniques that serve in offering software, computation and storage services on the cloud; Software Defined Networks (SDN) and Software Defined Storage	
CO4	cloud storage technologies and relevant distributed file systems, NoSQL databases and object storage;	
CO5	The variety of programming models and develop working experience in several of them.	

	Department of Computer Science
	Class-B.C.A V semester
	Title of the Paper(Course) INFORMATION TECHNOLOGY TRENDS
	Course Code
communio organizati	Objective :-This course examines the interaction between information and methods of cation technology. It explores the impact that technology has on individuals and ons and the effects of current technology infrastructure plus use, duplication, and ion of information in our world.
On comp	pletion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.
	Course out Comes
CO1	To make students well versed in all data mining algorithms, methods of evaluation.
CO2	To impart knowledge of tools used for data mining
CO3	To provide knowledge on how to gather and analyze large sets of data to gain useful business understanding.
CO4	To impart skills that can enable students to approach business problems analytically by identifying opportunities to derive business.
CO5	Understand the fundamentals of wireless networks

	Department of Computer Science
ı.	Class-B.C.A V semester
ŀ	Title of the Paper(Course) Human values and professional ethics
L	Course Code
satisfying	bjective :-It helps students understand practically the importance of trust, mutually human behavior and enriching interaction with nature. Ability to develop appropriate ies and management patterns to create harmony in professional and personal life.
On comp	letion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.
I	Course out Comes
CO1 ^a Un	derstand the consequences of ignoring and non-compliance with ethical imperatives.
CO2 Lea	arn about the best ethical practices and models.
CO3 De	velop a sound methodology in resolving ethical conflicts and crisis
	arn about the issues directly related to information technology environment and offessionals
CO5	10000000000000000000000000000000000000
	0 1
	Course out Comes
CO 1	To understand professional responsibility of a Student
CO 2	To appreciate ethical norms.
CO 3	To appreciate ethical dilemma while discharging duties in professional life.
CO 4	To understand Attitude formation and function.

To understand moral value and character Building.

	Department of Computer Science		
	Class-B.C.A VI semester		
	Title of the Paper(Course) computer Graphics		
	Course Code		
<u>Course Objective</u> :-explain the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two and three dimensions. identify a typical graphics pipeline and apply graphics programming techniques to design and create computer graphics.			
On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.			
	Course out Comes		
CO1	Students will demonstrate an understanding of contemporary graphics hardware.		
CO2	Students will create interactive graphics applications in C++ using one or more graphics.		
CO3	Students will create interactive graphics applications in C++ using one or more graphics application programming interfaces.		
CO4	Students will write program functions to implement graphics primitives.		
CO5	Students will write programs that demonstrate geometrical transformations.		

	Department of Computer Science	
	Class-B.C.A VI semester	
	Title of the Paper(Course) operational Research	
	Course Code	
they are a Knowledge	<u>Course Objective</u> :-Ability to understand and analyse managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively. Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry.	
On	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
Course out Comes		
CO1	To impart knowledge in concepts and tools of Operations Research	
CO2	To understand mathematical models used in Operations Research	
CO3	To apply these techniques constructively to make effective business decisions	
CO4	Solving questions related to resources' operations such as: human, machine, materials, energy, information, and funds.	
CO5	Solving operational questions and decision-making questions.	

Department of Computer Science	
Class-B.C.A VI semester	
Title of the Paper(Course) web designing using PHP	
Course Code	
<u>Course Objective</u> :-The objective of this course is to provide the necessary knowledge to design and develop dynamic, database-driven web applications using PHP version. Students also learn how to configure PHP and Apache Web Server.	
On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
Course out Comes	

Course out Comes	
CO1	Understand how server-side programming works on the web.
CO2	PHP Basic syntax for variable types and calculations.
CO3	Using PHP built-in functions and creating custom functions
CO4	How to receive and process form submission data. and Reading and writing cookies.
CO5	Create a database in phpMyAdmin. Read and process data in a MySQL database.

	Department of Computer Science	
	Class-B.C.A VI semester	
	Title of the Paper(Course) Principles of management	
	Course Code	
applic	<u>Course Objective</u> :-To study the functions and principles of management and the application of the principles in an organization also enable the effective and barriers communication and controlling in the organization.	
C	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	To understand nature ,Characteristics , Function ,Importance of management	
CO2	To understand Planning and component ,Objectives of business	
CO3	To understand organizing ,Deprtmentation and staffing	
CO4	To understand principle of Direction and human Relation	
CO5	To understand technique of control in management	

	Department of Computer Science
	Class-M.ScI semester
	Title of the Paper(Course) computers and communication Fundamentals
	Course Code
impleme and gair systems	apletion of the course, the student is expected to be able to : Knowledge and Understanding of
	computer system. Course out Comes
CO1	Build an understanding of the fundamental concepts of data communication and computer networking.
CO2	Understand how errors detected and corrected that occur in transmission
CO3	How collisions to be handled when many stations share a single channel
CO4	Know about routing mechanisms and different routing protocols

Know about different application layer protocols

CO5

	Department of Computer Science	
	Class-M.ScI semester	
	Title of the Paper(Course) discrete structure	
	Course Code	
Cour	<u>Course Objective</u> :-The student will be able to use logical notation and Perform logical proofs.	
On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
Course out Comes		
CO1	Be able to reason at multiple levels of detail and abstraction, being aware, in particular, of the applicability and limitations of tools from mathematics and theoretical computer science	
CO2	Recognize the context in which a computer system may function, including its interactions with people and the physical world.	
СОЗ	Able to communicate with, and learn from, experts from different domains throughout their careers	
CO4	Possess a solid foundation that allows and encourages them to maintain relevant skills as the field evolves	
CO5	To be able to manage their own career development and advancement	

Govt. Holkar (Model.Autnomous) Science College ,Indore
Department of Computer Science
Class-Msc Isem
Title of the Paper(Course) Operating System
Course Code

<u>Course Objective</u>: A successful student will be able to understand the basic components of a computer operating system, and the interactions among the various components. The course will cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems.

	Course out Comes	
CO1	Introduction and evoluation of Operating system along with various types.	
CO2	Schedule CPU time using scheduling algorithm for processors	
CO3	Apply page replacement policies for dynamic memory management	
CO4	Design and construct the following OS components: System calls, Schedulers, Memory management systems, Virtual Memory and Paging systems, Deadlock prevention and avoidance.	
CO5	Working with linux OS. Introduction to various linux commands and vi editor etc.	

	Govt. Holkar (Model.Autnomous) Science College ,Indore	
	Department of Computer Science	
	Class-M.sc I semester	
	Title of the Paper(Course) Programming & Problem solving through C language	
	Course Code – 5	
	<u>Course Objective:</u> The course will stress on fundamental parts of programming language, so that the students will have a basic concept for understanding and using other programming language.	
On co	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	General Knowledge of Programming types, Problem solving concepts, usage of Algorithm/ Flowchart .Writting, compiling and debugging programs in C language	
CO2	students will learn how to design structure of c programs, using tokens	
CO3	Formatted and unformatted I/O ,control statement and Looping.Design programs containing decision structures.	
CO4	Array(1-d,2-d), Functions & Recursion, string handeling.	
CO5	structure,preprocessor directives(macros).	

	Department of Computer Science	
	··	
	Class-M.sc II semester	
	Title of the Paper(Course) Computer Network	
	Course Code	
impleme network	<u>Course Objective</u> :-The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems.	
On com	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	Explain the importance of data communications and the Internet in supporting business Communications and daily activities.	
CO2	Analyze the services and features of the various layers of data networks.	
CO3	Explain how communication works in data networks and the Internet.	
CO4	Recognize the different internetworking devices and their functions.	

CO5

Explain the role of protocols in networking.

	Govt. Holkar (Model.Autnomous) Science College ,Indore	
	Department of Computer Science	
	Class-M.Sc II semester	
	Title of the Paper(Course) Data structure using c++	
	Course Code -	
& bas	e <u>Objective</u> :-To understand concepts about searching and sorting techniques ic concepts about stacks, queues, lists, trees, graphs and about writing algorithms and step by proach in solving problems with the help of fundamental data structures.	
On co.	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	Introduction to C, key concepts of object oriented programming, unformatted & formatted console I/O oprations.	
CO2	parts of C program, tokens, oprators, Control structures.	
CO3	Functions, function overloading, demonstration of Classes and objects, implementing abstraction using access specifiers.	
CO4	Operator overloading, reusing code through Inheritance and its types.	
CO5	Pointer & Arrays of classes, implementing Polymorphism, Template, Handling Exceptions	

Department of Computer Science
:
Class-M.Sc II semester
Title of the Paper(Course) Computer Oriented Numerical Methods
Course Code

<u>Course Objective</u>:-To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.

On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.

Course out Comes	
CO1	To develop the mathematical skills of the students in the areas of numerical methods.
CO2	To teach theory and applications of numerical methods in a large number of engineering subjects which require solutions of linear systems
CO3	finding Eigen values, eigenvectors, interpolation and applications, solving ODEs, PDEs.
CO4	To lay foundation of computational mathematics for post-graduate courses specialized studies and research.
CO5	Dealing with statistical problems like testing of hypotheses.

Department of Computer Science	
Class-M.Sc II semester	
Title of the Paper(Course) DataBase Management System	

<u>Course Objective</u>:-The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a DBMS.

Course out Comes	
CO1	Demonstrate the basic elements of a relational database management system.
CO2	Identify the data models for relevant problems.
CO3	Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data.
CO4	Demonstrate their understanding of key notions of query evaluation and optimization techniques.
CO5	Extend normalization for the development of application software's.

	Department of Computer Science	
	••	
	Class- M.Sc III semester	
	Title of the Paper(Course) Programming with java	
	Course Code	
compile,	<u>Objective</u> : The student should be able to: Use an integrated development environment to write, run, and test simple object-oriented Java programs. Read and make elementary modifications to grams that solve real-world problems.	
On co	ompletion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
	Course out Comes	
CO1	The students will have the competence in the use of Java Programming language	
CO2	The development of small to medium sized application programs that demonstrate professionall acceptable coding.	
CO3	An understanding of the principles and practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements.	
CO4	Design and implement an application that demonstrates their competency with Java syntax, structure and programming logic, incorporating basic features of the language as well as some features from the I/O (Input/Output) or GUI libraries	
CO5	Competence in the use of Java Programming language in the development of small to medium sized application programs that demonstrate professionally acceptable coding and performance standards.	
	Department of Computer Science	
	Class- M.Sc III semester	
	Title of the Paper(Course) Database Applications and tools	
	Course Code	
Course (sized application programs that demonstrate professionally acceptable coding and performand standards. Department of Computer Science Class- M.Sc III semester Title of the Paper(Course) Database Applications and tools	

Course out Comes		
CO1	Eliminate redundant data.	
CO2	Make access to the data easy for the user.	
CO3	Provide for mass storage of relevant data.	
CO4	CO4 Protect the data from physical harm and un-authorised systems.	
CO5	Allow for growth in the data base system and Maintaining Warehouse.	

	Department of Computer Science		
	Class- M.Sc III semester		
	Title of the Paper(Course) Theory of computation		
	Course Code		
<u>Course Objective</u> :- explain the models of computation, including formal languages, grammars and automata, and their connections.			
On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.			
Course out Comes			
CO1	CO1 To give an overview of the theoretical foundations of computer science from the perspective of formal languages		
CO2			
CO3			
CO4	To solve various problems of applying normal form techniques, push down automata and Turing Machines		
CO5	To familiarize Regular grammars, context frees grammar		

epartment of Computer Science	
Class-M.Sc III semester	
Title of the Paper(Course) Linux/unix Administration	
Course Code -	

<u>Course Objective</u>:-The student should be able to: Identify and use UNIX/Linux utilities to create and manage simple file processing operations, organize directory structures with appropriate security, and develop shell scripts to perform more complex tasks.

On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.

Course out Comes	
CO1	Learn UNIX structure, commands, and utilities
CO2	Describe and understand the UNIX file system
CO3	Write shell scripts in order to perform shell programming
CO4	Acquire knowledge about text processing utilities, process management and system operation of UNIX.
CO5	Installation of softwares and hardwares on unix operating system

Department of Computer Science	
Class-M.Sc IV semester	
Title of the Paper(Course) System Analysis and Design	
Course Code -	

<u>Course Objective</u>:-Provides overview of the system development life cycle (SDLC) emphasizing analytical techniques to develop the correct definition of business problems and user requirements. Students will prepare a feasibility assessment and develop system requirements for an assigned project.

Course out Comes		
	<u>Course out Comes</u>	
CO1	A firm basis for understanding the life cycle of a systems development project;	
CO2	An understanding of the analysis and development techniques required as a team member of a medium-scale information systems development project;	
CO3	An understanding of the ways in which an analyst's interaction with system sponsors and users play a part in information systems development;	
CO4	Experience in developing information systems models;	
CO5	Experience in developing systems project documentation;	

	Department of Computer Science		
	Class-M.Sc IV semester		
	Title of the Paper(Course) Design and Analysis of Algorithm		
Course Code -			
<u>Course Objective</u> : - Apply important algorithmic design paradigms and methods of analysis. Synthesize efficient algorithms in common engineering design situations.			
On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.			
Course out Comes			
CO1	CO1 Analyze the asymptotic performance of algorithms.		
CO2	Demonstrate a familiarity with major algorithms and data structures.		
CO3	CO3 Write rigorous correctness proofs for algorithms.		

Departme	ent of Computer Science
Clas	s-M.Sc IV semester
Title of the Paper(Co	urse) Internet and Web Technology
	Course Code -

Apply important algorithmic design paradigms and methods of analysis.

Synthesize efficient algorithms in common engineering design situations.

CO4

CO₅

<u>Course Objective</u>: This course is intended to teach the basics involved in publishing content on the World Wide Web. Create web pages using XHTML and Cascading Style Sheets. Build dynamic web pages using JavaScript (Client side programming). Build interactive web applications.

Course out Comes		
CO1	Analyze a web page and identify its elements and attributes.	
CO2	Create web pages using XHTML and Cascading Style Sheets	
CO3	Build dynamic web pages using JavaScript (Client side programming).	
CO4	Analyze to Use appropriate client-side or Server-side applications	
CO5	Build interactive web applications using crud.	

Department of Computer Science Class-M.Sc IV semester Title of the Paper(Course) Compiler Design Course Code -

<u>Course Objective</u>: The Objectives of this course is to explore the principles, algorithms, and data structures involved in the design and construction of compilers. Topics include context-free grammars, lexical analysis, parsing techniques, symbol tables, error recovery, code generation, and code optimization.

Course out Comes	
CO1	Understand the major phases of compilation and to understand the knowledge of Lex tool
CO2	Develop the parsers and experiment the knowledge of different parsers design without automated tools
CO3	Construct the intermediate code representations and generation
CO4	Convert source code for a novel language into machine code for a novel computer
CO5	Apply for various optimization techniques for dataflow anlysis

	epartment of Computer Science		
	Class-M.PhilCS I semester		
	Title of the Paper(Course) Computer Application		
	Course Code		
under	<u>Course Objective</u> : The aims of Computer Application is provides students with an opportunity to develop understanding of the basic operations of a computer system and computer applications software. Meanwhile, they also develop the skill of using computer applications software for solving problems.		
On c	On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.		
	<u>Course out Comes</u>		
CO1	To understand basic knowledge of fundamental of computer		
CO2	To learn everything about the various types of number systems, conversion rules along with their conversions		
CO3	To enable you, the user, to create and edit documents. This is the word processing component, and it allows you to type whatever you want and save it to view or edit later. These saved files can also be sent to another person, who can view it with her own word processing software.		
CO4	To used different types of data analysis tools and softwares		
CO5	To understand report writing, research paper writing, thesis writing etc.		

epartment of Computer Science

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Class-M.Phil.-CS I semester

Title of the Paper(Course) Quantitative techniques

Course Code

<u>Course Objective</u>: Quantitative techniques used to solve many of the problems that arise in a business or industrial area. It is used by social scientists, including communication researchers, to observe phenomena or occurrences affecting individuals.

On completion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.

Course out Comes		
CO1	To understand different data types, graphical representation	
CO2	to understand different types of deviations, correlation, regression etc	
CO3	To undersand different tyes of test like; student T test, chi-square test F test, SPSS tool etc	
CO4	To analysion different tyes of data using different application softwares.	
CO5	To undersand different tyes of simulation medhods and its application in different research areas	

Class-M.PhilCS
Title of the Paper(Course) Network Security and Cryptography
Course Code

<u>Course Objective</u>: The main goal of the paper is to protect the confidentiality, integrity, and availability of information. means that only people with the right permission can access and use information

On completion of the course, the student is expected to be able to:

Course out Comes	
CO1	Describe network security services and mechanisms.
CO2	Symmetrical and Asymmetrical cryptography.
CO3	Data integrity, Authentication, Digital Signatures.
CO4	Various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc
CO5	Understand network security threats, security services, and countermeasures

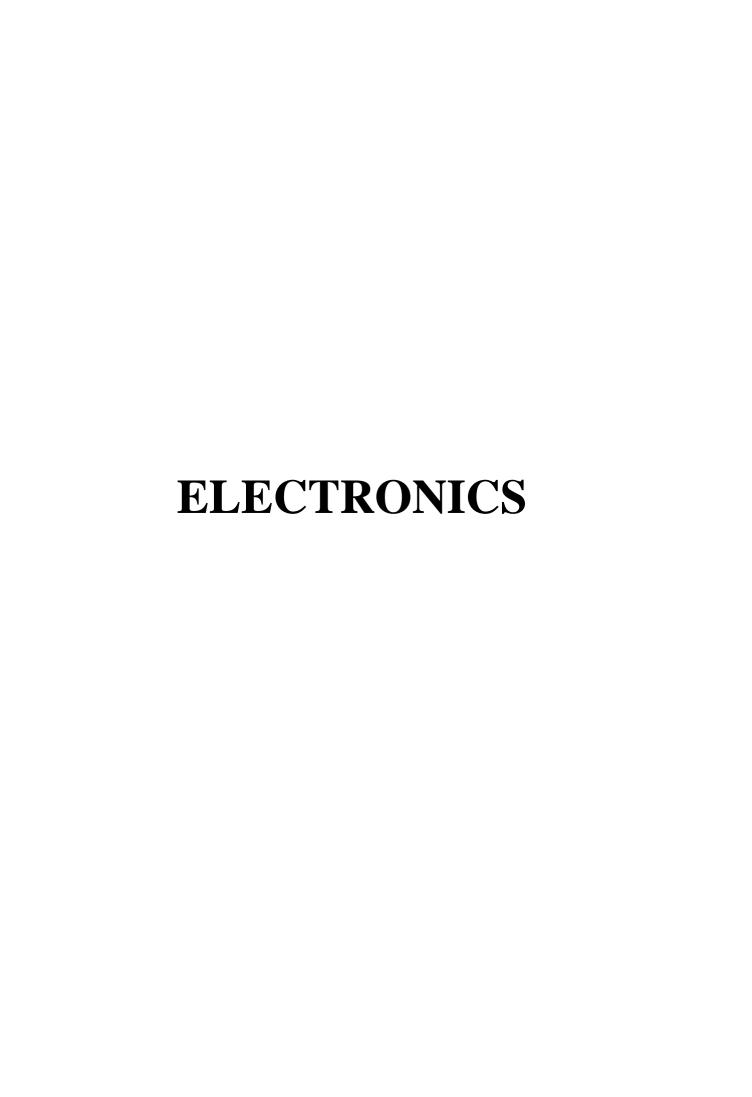
Class-M.Phil.-CS Title of the Paper(Course) Object Oriented Modeling and Technology Course Code

<u>Course Objective</u>: The main goal of the paper is to protect the confidentiality, integrity, and availability of information. means that only people with the right permission can access and use information

	Course out Comes
CO1	Demonstrate the importance of modelling in the software development life cycle.
CO2	Become familiar with the Unified modelling Language.
CO3	Employ the Unified modelling Language notations to create effective and efficient system designs.
CO4	Understand the difference between writing programs for the software and doing analysis and design.
CO5	Problem formulation and decomposition (analysis) and solution building (design) will be covered.
	Department of Computer Science
	Class-M.PhilCS II semester
	Title of the Paper(Course) Literature review
	Course Code
	Objective : The main goal of the paper is to protect the confidentiality, integrity, and availability nation. means that only people with the right permission can access and use information

	On completion of the course, the student is expected to be able to :
	Course out Comes
CO1	Deeply review the literature in specific research areas of computer science filed.

	Govt. Holkar (Model.Autnomous) Science College ,Indore	
	Department of Computer Science	
	Class-BCA V sem	
	Title of the Paper(Course) Data Science	
	Course Code	
	Objective The key objective of Data Science is to extract valuable information for use in edecision making, product development, trend analysis, and forecasting.	
On con	mpletion of the course, the student is expected to be able to : Knowledge and Understanding of computer system.	
CO1	Students will develop relevant programming abilities.	
CO2	Students will demonstrate proficiency with statistical analysis of data.	
CO3	Students will develop the ability to build and assess data-based models .	
CO4	Students will execute statistical analyses with professional statistical software .	
CO5	Students will demonstrate skill in data management.	



Govt. Holkar (Model.Autnomous) Science College ,Indore

Department of **ELECTRONICS** Class-B.Sc. I Year

Title of the Paper(Course) (Paper-I): **Basics of Semiconductors & Devices** Course Code: EL-1101

<u>Course Objective</u>: To know the basic knowledge of electronic components (Active & Passive), circuits, laws of current and voltage, circuit theorems and semiconductor electronics.

After the completion of this course, students will have understanding of

Course Outcomes	
CO1	Basic knowledge of current, voltage and charges.
CO2	Kirchhoff's law of voltage and current.
CO3	Types of components used in Electronics field.
CO4	Study of Diodes and their special types.
CO5	Basic understanding of transistor.

Title of the Paper(Course) (Paper-II): Electronics Circuit and Fundamental of Digital Electronics

Course Code - EL-1102

<u>Course Objective</u>: To know the basic knowledge of electronic circuits like Power supply, Amplifier, Oscilators, Wave Shapping Circuits etc.

After the completion of this course, students will have understanding of

<u>Course Outcomes</u>	
CO1	Construction of a regulated power supply.
CO2	Properties and parameters of FET and MOSFET.
CO3	Implementation of amplifier using transistors
CO4	Applications of diodes and transistors.
CO5	Number system and Boolean mathematics.

Govt. Holkar (Model.Autnomous) Science College ,Indore Department of ELECTRONICS Title of the Paper(Course) (Paper-I): Digital Electronics & Microprocessor Course Code: EL-2101 Course Objective: 1. To know about working and designing of digital circuit. 2. To know the Basics of microprocessor 8085. 3. To learn the assembly programming. After the completion of this course, students will have understanding of Course Outcomes CO1 Different types of Logic gates and their implementation in designing complex circuits. CO2 Concepts of logic families. CO3 Knowledge of counters and registers.

Title of the Paper(Course) (Paper-II): OPERATIONAL AMPLIFIER AND INSTRUMENTATI	ION

Introduction of 8085 microprocessor and it's interfacing with devices.

Course Code : EL-2102

Course Objective: 1. Understand the operational amplifier.

Basic understanding of A/D and D/A coverters.

2. Study the measuring instruments.

CO₄

CO₅

3. To gain knowledge on Bio-medical instruments.

After the completion of this course, students will have understanding of

<u>Course Outcomes</u>	
CO1	Basic of operational amplifier.
CO2	Different parameter and applications of operational amplifier.
CO3	Working of CRO and LCD.
CO4	Study of types of filters and signal generators.
CO5	Study of life saving biomedical instruments.

	Govt. Holkar (Model.Autnomous) Science College ,Indore		
	Department of ELECTRONICS		
	Title of the Paper(Course) (Paper-I): Microprocessor and Interfacing		
	Course Code : EL-3101		
Progra 2. To	Course Objective :1. To understand Microprocessor 8085 and Assembly Language Programming. 2. To understand the Interfacing of Peripheral Devices with Microprocessor. After the completion of this course, students will have understanding of		
<u>Course Outcomes</u>			
CO1	Understand the Architecture and Pin diagram of 8085 Microprocessor.		
CO2	Assembly Language Programming Concepts		
CO3	Various Type of Interrupts		
CO4	Memory Interfacing with 8085 Microprocessor		
CO5	Pheriphal Interfacing with 8085 Microprocessor		

Govt. Holkar (Model.Autnomous) Science College ,Indore Department of **ELECTRONICS** Title of the Paper(Course): Electronics Communication & Instrumentation Course Code: EL-3201 **Course Objective**: 1.To give exposure on the field of Communication Electronics. 2. Understand the mechanism of various electronics instruments After the completion of this course, students will have understanding of **Course Outcomes** CO₁ Working of Measuring Instruments CO₂ Idea and Working of Bridges and Transducers. CO₃ Various generation techniques in Amplitude modulation and demodulation. CO4 Various generation techniques in Frequency modulation and demodulation.

Concepts of Digital Modulation Techniques

CO₅

FORENSIC SCIENCE

	Govt. Holkar (Model ,Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE		
	Class- BSc. I Year		
	Title of the Paper (Course) Introduction of forensic science		
	Course Code 122-I		
Course C	Dbjective: 1. To know about basic principle of forensic.		
2. To kno	2. To know about different searching, sketching, evidences.		
Course C	Outcomes: After completion of this paper students will know-		
CO1	Basic concept of forensic science.		
CO2	Basic knowledge and concept of crime scene and searching methods.		
CO3	Basic knowledge of crimes.		
CO4	Basic understanding of forensic institution of India.		
CO5	Basic understanding of FSL.		

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE		
	Class- BSc. I Year		
	Title of the Paper (Course) Crime Investigation		
	Course Code 122 -II		
Course C	Dbjective: 1. To know about the police organization structure of India.		
2. To kno	2. To know about the management of physical evidences.		
Course C	Outcomes: After completion of this paper students will know-		
CO1	Understanding of physical evidences.		
CO2	Basic management of biological and toxicological physical evidences.		
CO3	Basic management of chemical, physical and ballistics evidences.		
CO4	Basic knowledge of state police and para military forces.		
CO5	Basic knowledge of non-armed forces.		

Govt. Holkar (Model, Autonomous) Science College, Indore Department of FORENSIC SCIENCE Class-BSc. II Year Title of the Paper (Course) Indian Penal Code, Criminal Procedure Code, Indian Evidence Act And Judicial system Course Code - 222-I Course Objective: 1. To know Indian judicial system. 2. To know functioning of court in India. Course Outcomes: After completion of this paper students will know-Basic of Indian penal code. CO₁ Basic of criminal procedure code. CO₂ Basic of Indian evidence act. CO₃ Basic of Indian judicial system. CO4 Relationship of forensic science and Indian judicial system. CO5

Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of FORENSIC SCIENCE
	Class- BSc. II Year
	e of the Paper (Course) Examination of Physical Evidences & Forensic istics
	Course Code 222-II
Course C	Dispective: 1 To know fingerprint, documents, handwriting and its analysis.
2. To kno	w biological evidence, physical evidence and it examination.
Course C	Outcomes: After completion of this paper students will know-
CO1	Basic of fingerprint and its examination.
CO2	Basic of documents and handwriting.
CO3	Basic of saliva, urine, blood and DNA & its analysis.
CO4	Basic of firearm and ammunition.
CO5	Basic of hair, fiber, glass, fire related cases.

	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of FORENSIC SCIENCE	
	Class- BSc. III Year	
Title	e of the Paper (Course) Forensic Medicine and Toxicology	
	Course Code - 322-I	
	Dijective: 1. To know the forensic medicine jurisprudence, forensic pathology sic psychology.	
2. To kno	w the forensic toxicology and clinical toxicology.	
Course C	Outcomes: After completion of this paper students will know-	
CO1	Basic knowledge of medical jurisprudence.	
CO2	Basic knowledge of forensic pathology.	
CO3	Basic knowledge of forensic psychiatry.	
CO4	Basic knowledge of forensic toxicology.	
CO5	Basic knowledge of clinical toxicology.	

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE		
	Class- BSc. III Year		
Title	e of the Paper (Course) Detective Tools and Techniques		
	Course Code - 322-II		
Course C	Dijective: 1. To know the different detective tools used in forensic science.		
2. To kno	2. To know the chromatography, microscopy and electrophoresis.		
Course C	Dutcomes: After completion of this paper students will know-		
CO1	Basic knowledge of detective tools.		
CO2	Basic knowledge of microscopy and chromatography.		
CO3	Basic knowledge of spectroscopy and electrophoresis.		
CO4	Basic knowledge of centrifugation and radio isotopic method.		
CO5	Basic knowledge of molecular biology.		

	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of FORENSIC SCIENCE	
	Class-M.sc. I SEM	
Title	e of the Paper (Course) Forensic Science and Criminal Justice System	
	Course Code FS-11	
	Dbiective: 1-To know basic principle & understanding of forensic science nal justice system.	
2 -To know understanding of crime scene management.		
Course Outcomes: After completion of this paper students will know-		
CO1	The basic and fundamental principle of forensic science.	
CO2	The importance and effects of forensic science to humankind	
CO3	The working mechanism of police	
CO4	The working of the forensic installation in India.	
CO5	The relationship between courts, forensic science and police	

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE		
	Class-M.sc. I SEM		
	Title of the Paper (Course) Forensic Medicine		
	Course Code FS-12		
Course (Objective: 1- To understand the basic concept of forensic medicine and cedures.		
	2- To have knowledge of personal identity traits, postmortem examination, injuries and different modes of death.		
Course C	Course Outcomes: After completion of this paper students will know-		
CO1	Forensic medicine and legal procedures of court.		
CO2	Different parameters to fix personal identity.		
CO3	Injuries and their medico legal importance.		
CO4	Understanding of death, postmortem changes and death due to asphyxia		
CO5	Postmortem examination and sexual offences.		

Govt. Holkar (Model, Autonomous) Science College, Indore

Department of FORENSIC SCIENCE

Class-M.sc. I SEM

Title of the Paper (Course) Questioned Documents, Finger Prints and Impressions

Course Code **FS-13**

Course Objective: 1-To know about questioned document, handwriting and signature analysis.

2-To know about the fingerprint and its development & examination of others prints.

Course Outcomes: After completion of this paper students will know-

CO1	Basic concept of questions documents, understanding of ink and paper & its examination.
CO2	Basic understanding of handwriting & signature and its examination.
CO3	Basic understanding of typewriting, forged documents and its examination.
CO4	Basic concept and knowledge of fingerprint, its type and examination.
CO5	Basic understanding of foot & footwear print, others print & its examination.

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE		
	Class-M.sc. I SEM		
	Title of the Paper (Course) Instrumental Method – Physical		
	Course Code FS-14		
	Objective: 1- To be familiar with the process of calibration, qualitative and ve analysis.		
2-To und	2-To understand working of different instruments for forensic aspects.		
Course C	Outcomes - After completion of these paper students will know-		
CO1	Basic concept and working procedure of different spectroscopy.		
CO2	Basic principle and instrumentation of UV- Vis techniques.		
CO3	Basic understanding of radio chemical techniques.		
CO4	Basic principle of IR spectroscopy.		
CO5	Basic understanding of qualitative and quantitative analysis of forensic samples.		

	Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE		
	Class-M.sc. II SEM		
	Title of the Paper (Course) Instrumental Method – Chemical		
	Course Code FS-21		
	<u>Course Objective:</u> 1- To know basic principle & understanding of forensic science and criminal justice system.		
2-To kno	2-To know understanding of crime scene management.		
Course Outcomes: After completion of this paper students will know-			
CO1	Sample preparation and treatment techniques.		
CO2	Principle and application of optical microscopy and electron microscopy.		
CO3	Principle, instrumentation and application of various chromatographic techniques.		
CO4	Knowledge of various types of electrophoretic techniques.		
CO5	Principle and instrumentation of mass spectrometry & hyphenated techniques.		

Govt. Holkar (Model, Autonomous) Science College, Indore		
Department of FORENSIC SCIENCE		
Class-M.sc. II SEM		
Title of the Paper (Course) Forensic Biology		
Course Code FS-22		
Course Objective: 1-To learn the importance of biological viscera and other samples.		
2-To know about the various botanical evidences and wildlife crimes & its examination.		
Course Outcomes: After completion of this paper students will know-		
CO1	Basic knowledge and understanding of human body system.	
CO2	Knowledge about the body fluids, preservation and their analysis.	
CO3	Importance of teeth and its examination procedure.	
CO4	Basic knowledge about the hair, fiber and their examination & importance of botanical evidences.	
CO5	Knowledge and importance of insects and wildlife in forensic science.	

Govt. Holkar (Model, Autonomous) Science College, Indore		
Gova Honai (Wodel, Matonomous) Science Conege, Indore		
Department of FORENSIC SCIENCE		
Class-M.sc. II SEM		
Title of the Paper (Course) Forensic Chemistry and Explosives		
Course Code FS-23		
Course Objective: 1-To know about the all-chemical procedure which used in investigation.		
2-To know about the explosive substances and its analysis.		
Course Outcomes: After completion of this paper students will know-		
CO1	Sample preparation and treatment techniques.	
CO2	Principle and application of optical microscopy and electron microscopy.	
CO3	Principle, instrumentation and application of various chromatographic techniques.	
CO4	Knowledge of various types of electrophoretic techniques.	
CO5	Principle and instrumentation of mass spectrometry & hyphenated techniques.	

Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE	
	Class-M.sc. II SEM	
	Title of the Paper (Course) Forensic Toxicology and Pharmacology	
	Course Code FS-24	
Course (Course Objective: 1-To know about the poisoning and classification of poisons.	
2-To learn the methods of postmortem.		
Course Outcomes: After completion of this paper students will know-		
CO1	Basic introduction and methods of analysis of different poisons.	
CO2	Knowledge of medico legal aspect of sign and symptoms of poisoning.	
CO3	Knowledge of drugs abuse and its analysis process.	
CO4	Basic knowledge of pharmacological pathway of drugs.	
CO5	Knowledge about relationship of police officer, doctor in medico legal cases.	

Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE	
	Class-M.sc. III SEM	
Title of the Paper (Course) Forensic Ballistics		
	Course Code FS-31	
Course Objective: 1-To know about the science behind the bullet, it structure & Formation and it different parts.		
2-To know about the classification forensic ballistics.		
Course Outcomes: After completion of this paper students will know-		
CO1	Knowledge the mechanism of firing and trajectory formation.	
CO2	Basic concept of internal ballistics.	
CO3	Basic concept of bullet wounds.	
CO4	Basic knowledge of ammunition.	
CO5	Basic understanding of GSR analysis.	

	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of FORENSIC SCIENCE	
	Class-M.sc. III SEM	
	Title of the Paper (Course) Instrumental methods- Biology	
	Course Code FS-32	
Course Canalysis	Dbjective: 1. To know about different instrument related to biological	
2.To knov	w applied genetic engineering and higher detection biological methods.	
Course C	Dutcomes : After completion of this paper students will know-	
CO1	The knowledge of centrifugal method.	
CO2	Basic knowledge of types of enzymatic techniques and its application.	
CO3	Basic knowledge of RIA, ELISA and immune techniques	
CO4	Basic knowledge of applied genetic engineering	
CO5	Basic knowledge of cell and tissue culture.	

Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE	
	Class-M.sc. III SEM	
	Title of the Paper (Course) Forensic Serology	
Course Code FS-33		
Course C	Course Objective: 1-To know about the bio molecule and its examination.	
2-To know the genetic, biological fluid and its examination.		
Course Outcomes: After completion of this paper students will know-		
CO1	Basic concept of bio molecule, their importance and examination.	
CO2	Basic concept of genetics and gene.	
CO3	Knowledge of immune system.	
CO4	Basic concept of origin of species.	
CO5	Basic knowledge of blood groups and different types of markers.	

Department of FORENSIC SCIENCE

Class-M.sc. III SEM

Title of the Paper (Course) Finger Prints, Impressions and Their Examination

Course Code FS-33

Course Objective: 1-To know the classification and analysis of fingerprint.

2-To know about the chemical and physical method of analysis of fingerprint and other impressions.

Course Outcomes: After completion of this paper students will know-

CO1	Knowledge and importance of finger print history, classification of fingerprint.
CO2	Basic understanding of types, patterns and others peculiarities of fingerprint.
CO3	Basic concept of development methods of fingerprint.
CO4	Knowledge of foot & footwear print, skid marks, tyre marks and other impressions.
CO5	Basic knowledge of examination of other impressions such as skid, tyre etc.

Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE	
	Class-M.sc. III SEM	
Title of the Paper (Course) DNA Profiling		
Course Code FS-34		
Course Objective: 1-To know DNA structure.		
2-To know about the DNA profiling and other techniques.		
Course Outcomes: After completion of this paper students will know-		
CO1	Basic concept of gene, configuration of nucleic acid and chromosomes.	
CO2	Understanding of detection techniques in DNA profiling.	
CO3	Knowledge of handling, collection, presentation and storage of DNA samples.	
CO4	Knowledge of Ethics, validation and forensic issues of DNA samples.	
CO5	Understanding of legal prospective of DNA profiling.	

Govt. Holkar (Model, Autonomous) Science College, Indore			
	Department of FORENSIC SCIENCE		
	Class-M.sc. III SEM		
	Title of the Paper (Course) Pharmaceutical Jurisprudence		
	Course Code FS-34		
Course C	Course Objective: 1-To know about the pharmaceutical jurisprudence.		
2-To know about the different acts and law related to pharmaceutical.			
Course Outcomes: After completion of this paper students will know-			
CO1	Basic knowledge of pharmaceutical and drugs legislation in India.		
CO2	Basic knowledge of acts, rules related to drugs and cosmetics.		
CO3	Basic knowledge of acts, rules related to food safety, adulteration & factories.		
CO4	Basic knowledge of intellectual properties related laws and rights.		
CO5	Basic concept of patent law.		

	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of FORENSIC SCIENCE	
	Class-M.sc. IV SEM	
	Title of the Paper (Course) Forensic Physics	
	Course Code FS-41	
	Dbjective: 1- To know about the physical evidences and its analysis such as , tool marks etc.	
2. To kno	w the photography, Speaker identification and its analysis.	
Course C	Outcomes: After completion of this paper students will know-	
CO1	Basic knowledge about glass, dust, soil, paint, cement, tool marks & their impo	
CO2	Understanding of tool marks, types and analysis	
CO3	Basic Understanding of voice and speaker identification.	
CO4	Basic knowledge crime scene photography.	
CO5	Basic understanding of Statistics and math.	

Govt. Holkar (Model, Autonomous) Science College, Indore Department of FORENSIC SCIENCE Class-M.sc. IV SEM Title of the Paper (Course) Applied Forensic Science and Scientific Investigation of Crime Course Code FS-42 **Course Objective:** 1. To know about scientific knowledge used for crime investigation. 2.To know about different types crimes scene. Course Outcomes: After completion of this paper students will know-CO₁ Basic of crime scene, types and physical evidences. CO₂ Basic knowledge of different types of patterns. Basic understanding of scientific investigation of motor vehicle, fire and CO3 arsons cases. CO4 Concept of different types of civil and criminal cases studies. CO₅ Knowledge of carrier in forensic science.

Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE	
	Class-M.sc. IV SEM	
	Title of the Paper (Course) Emerging Trends in Forensic Science	
	Course Code FS-43	
Course Objective: 1-To know about the advance method of investigation used by scientist and investigator.		
2-To know scientific view of investigation.		
Course Outcomes: After completion of this paper students will know-		
CO1	Understanding of voice production and their analysis.	
CO2	Basic knowledge and concept of polygraph.	
CO3	Basic knowledge and concept of brain mapping.	
CO4	Basic understanding of narco-analysis.	
CO5	Basic knowledge of DNA profiling.	

Govt. Holkar (Model, Autonomous) Science College, Indore		
	Department of FORENSIC SCIENCE	
	Class-M.sc. IV SEM	
Title of the Paper (Course) Forensic Psychology		
Course Code FS-43		
Course Objective: 1-To know the basic term of forensic psychology.		
2-To know different psychometric assessment test and their application.		
Course Outcomes: After completion of this paper students will know-		
CO1	Understanding of history, ethics, scope of forensic psychology.	
CO2	Basic concept of different assessment test of psychology and application.	
CO3	Basic knowledge of abnormal behavior of criminal.	
CO4	Basic knowledge of juvenile delinquency.	
CO5	Basic concept of mental illness and their analysis.	

Govt. Holkar (Model, Autonomous) Science College, Indore			
	Department of FORENSIC SCIENCE		
	Class-M.sc. IV SEM		
	Title of the Paper (Course) Biometrics		
	Course Code FS-44		
Course (Course Objective: 1-To know about the permanent parameter of identification of human.		
2-To know the advance science of investigation.			
Course Outcomes: After completion of this paper students will know-			
CO1	Basic concept and knowledge of biometric.		
CO2	Basic knowledge of fingerprint and computerization of pattern& analysis.		
CO3	Basic knowledge of speaker and voice identification and analysis.		
CO4	Basic concept of face recognition method.		
CO5	Basic concept of bio or DNA microchip and other advance methods.		

	Govt. Holkar (Model, Autonomous) Science College, Indore	
	Department of FORENSIC SCIENCE	
	Class-M.sc. IV SEM	
	Title of the Paper (Course) Computer & Cyber Forensic	
	Course Code FS-44	
Course C	Dijective: 1. To know about the basic information of Computer.	
2.To knov	w the Investigation process of Computer & Cyber Forensic.	
Course C	Outcomes: After completion of this paper students will know-	
CO1	Basic concept and knowledge of Computer & Internet.	
CO2	Basic knowledge of Computer Crime.	
CO3	Basic knowledge of Internet & Digital Crime.	
CO4	Basic investigation knowledge of Computer & Cyber Crime.	
CO5	Basic Knowledge of social media, Cryptography & Stenography.	



Department of Geography

Class- B. Sc. I Year

Title of the Paper (Course): Physical Geography (Lithosphere)

Course Code- 123-I

Course Objectives: The objectives of the course into introduction the latest concept in Physical Geography, essentially Geomorphology, to the student of Geography.

- CO1 Students will be able to understand and explain the nature and scope of the subject as well as its various basic concepts.
- CO2 The students will be able to demonstrate their knowledge of the concepts and theories of the origin of The Solar System, Earth's age and its historical development with reference to various geological evidences (The Geological Time Scale).
- CO3 This course will also make students to understand and illustrate the internal as well as external structure (geomorphology) of the earth and associated forces active on both levels.
- **CO4** The students will be able to describe different concepts, theories and principles of geomorphology along with the processes that shape the landscape.
- CO5 Students will be able to identify various landforms, their distribution and associated processes and the stage of their development which will help them in collecting information from the ground level if goes in research field.

Department of Geography

Class- B. Sc. I Year

Title of the Paper (Course): Introduction to Geography & Human Geography

Course Code- 123-II

Course Objectives: The paper intends to acquaint the students with distinctiveness of geography as a field of learning social science as well as natural science. The philosophy and methodology of the subject is discussed in such a way that students develop a keen interest in the subject and pursue it for higher studies.

- CO1 The student will be able to describe what Geography and Human Geography are; their branches and their conceptual development as well as basic cultural elements.
- **CO2** It will make students to analyze various concepts regarding man environment relationships and the dichotomies of the subject for its proper growth.
- CO3 By learning about different tribes of the world in various physical environments the student will be able to understand and explain the concept of human adaptation to the environment.
- **CO4** The students will understand and analyze population dynamics and migration along with the importance of human resource and its development.
- CO5 The students will be able to explain the causes of the origin of settlement, their classification (Rural and Urban), their morphology and distribution patterns.

Department of Geography

Class- B. Sc. II Year

Title of the Paper (Course): Physical Geography (Atmosphere and Hydrosphere)

Course Code- 223-I

Course Objectives: The paper on physical geography is structured into components of Atmosphere and Hydrosphere. This paper emphasizes the constituents of the atmosphere, the dynamic nature of the processes associated with it and their contribution in making the earth habitable. The course content also leads to the identification of climatic differentiation on the earth and the consequences as human activities on the atmosphere processes. The component of oceanography similarly deals with the coastal processes and describes the vast and diversified resources that oceans hold.

- CO1 The students will be able to define weather and climate along with their elements. They will be able to demonstrate their knowledge about the chemical and physical (Layers) composition of the atmosphere.
- CO2 The students will be able to demonstrate the physical principles and processes governing the distribution of atmospheric temperature, pressure and circulation both horizontally and vertically.
- CO3 The students will develop an idea about various atmospheric phenomena like Air Masses, Fronts, and Cyclones along with their characteristics and classification. They will also become familiar with different types of climate of the world.
- **CO4** The students will build an idea about the bottom relief of the oceans along with various oceanic deposits and Corals.
- CO5 Students will understand the physical principles and processes governing the circulation (waves, currents, tides) and characteristics (temperature, density and salinity) of water on Earth.

Department of Geography

Class- B. Sc. II Year

Title of the Paper (Course): Economic Geography

Course Code- 223-II

Course Objectives: The objectives of this course is to acquaint the students with the spatial pattern of the world economy consisting other activities ranging from primary to tertiary sectors, their bases and causes of regional variation, recent world wide changes in the economy particularly in context of the globalization and to comprehend the contemporary issues facing the global economy.

- CO1 The students will understand the nature and scope of the subject along with different economic activities and sectors of economy (primary, secondary and tertiary).
- CO2 The students will be able to analyze the regional and global pattern of production and distribution of different agricultural crops, minerals and energy resources.
- CO3 Students will understand the concept of globalization and its impact on world economy. They will also be able to explain the favorable conditions for localization, growth and distribution of different industries in the world.
- CO4 Students will be able to explain the concept of regions, their formulation and their types. They will also analyze different theories and principles of regional planning with special reference to India.
- CO5 They will be able to describe various means of transportation along with factors affecting them and also locate on a map and describe important land, water and air routes of the world.

Department of Geography

Class- B. Sc. III Year

Title of the Paper (Course): Geography of India

Course Code-323-I

Course Objectives: The paper deals with the study and teaching to the students the physical, cultural conditions and acquaints the students relating to the sustainable development and regional specialization, diversification and environmental impact in the Globalization process

- CO1 The students get to know about their own country's physiographic features, climate, geological structure, drainage and natural vegetation. They will be able to describe and locate these features on map also.
- CO2 Students will be able to analyze the characteristics and regional distribution of population, resources, industries and agricultural activities in India.
- CO3 Students will be able to locate on a map major physical feature, cultural regions, economic features (resources, industries, agricultural regions etc.) and urban centres etc.
- **CO4** The students will get to know about the physical and cultural (socio-economic) aspects of their own state i.e. Madhya Pradesh.
- CO5 Students will understand the political aspect of the country. They will be able to critically analyse the Geopolitical issues of the country, its relationship with neighbouring countries and internal and external affairs.

Department of Geography

Class- B. Sc. III Year

Title of the Paper (Course): Environment and Resource Management

Course Code-323-II

Course Objectives: Through this paper students will be acquainted with interrelationship of the Resources and Environment and the Sustainable Development. This paper also deals with Conservation and Management for solving the environmental problems.

- **CO1** Students will be able to describe about environment and its relationship with man especially focusing on contemporary issues like environmental degradation, pollution, global warming, disaster management etc.
- CO2 They will be able to explain the importance of biodiversity and sustainable development and various principles and theories regarding it.
- **CO3** Students will understand the genesis, properties and distribution of soil, flora and fauna in the world. They will also be able to identify the problems regarding them and propose solutions for them.
- **CO4** Students will understand and explain ecological principles underpinning management of resources, populations, communities, and ecosystems.
- CO5 Students will be able to synthesize geographic knowledge and apply innovative research strategies to solve problems in resource conservation, environmental change, and sustainable development within the community, region, and world.



Department Of Industrial Fish and Fisheries

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Class - B.Sc. ISt Year

Paper 1 – Fish Introduction and Culture (Paper - I)

- CO1 Classification of Fishes.
- CO2 Identification of Fresh water Fishes.
- CO3 Carp Culture.
- CO4 Aquarium management.
- CO5 Exotic and Larvivorous Fishes.

Paper 2 - Anatomy and Biology of Finfish (Paper - II)

- CO1 Brief historical background of fisheries in context of India and Indian culture.
- CO2 Anatomical features of finfish.
- CO3 Functions of important internal organs and their role in integumentary, skeletal, digestive, respiratory, circulatory, nervous, urinogenital and reproductive system.
- CO4 Fecundity, growth and age determination.
- CO5 Parental care in fishes.

Govt. Holkar (Model autonomous) Science College, Indore Department Of Industrial Fish and Fisheries

Class – B.Sc. II nd Year

Paper 1- Aquaculture Fish Disease & Prawn Culture

- CO1 Aquaculture and their culture system.
- CO2 Modern aquaculture techniques such as pan and cage culture.
- CO3 Fish food, types and different feeding habits of fishes.
- CO4 fish disease their causes and treatment.
- CO5 prawn culture and commercial species of prawn.

Paper 2- Aquarium fishes, Ichthyology & Post harvest techniques

- CO1 Aquarium, their construction and different types of aquarium.
- CO2 Maintenance of aquarium and their tools.
- CO3 Origin and evolution of fishes.
- CO4 Fishes of different environment and their nature.
- CO5 Fish preservation and by- products of fishes.

Department Of Industrial Fish and Fisheries

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Class – B.Sc III rd Year

Paper 1- Fisheries Economics & Extension Education

CO1 Biochemical composition and nutritional value of fish.

CO2 Fish marketing system.

CO3 Fisheries co-operatives.

CO4 Govt. assistance in fisheries sector.

CO5 Fisheries extension education.

Paper 2- Limnology and Fish Productivity

CO1 Limnology- definition, history and scope.

CO2 Primary productivity of fish pond.

CO3 Reservoir fisheries.

CO4 Lentic and lotic fisheries resource of India.

CO5 Aquatic pollution causes and types.

Department of Fisheries

Class – M.F.Sc. 1 st Sem.

Paper – 1 st Finfish and Shellfish Biology

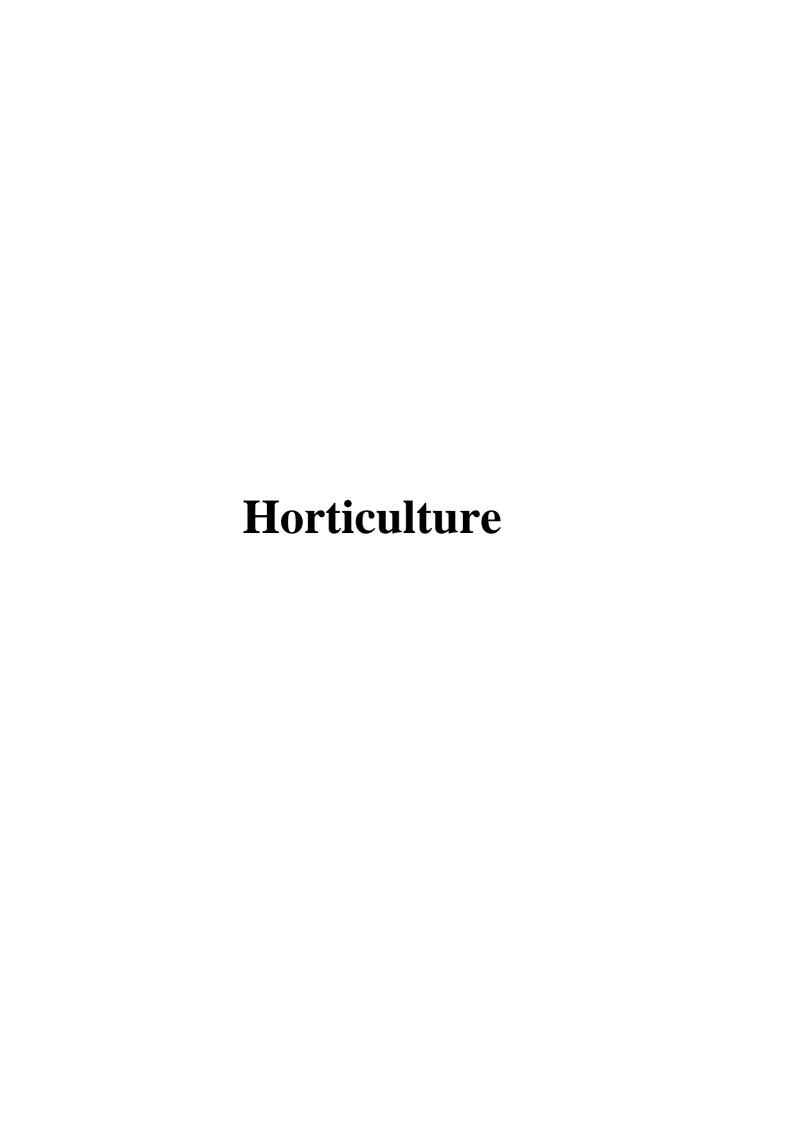
- CO 1. Diversity and Distribution of Fishes.
- CO 2. Digestive system of Prawn and Fishes.
- CO 3. Respiratory and circulatory system of Prawn and Fishes.
- CO 4. Reproductive system and Excretory system of Fishes and Prawn.
- CO 5. Nervous system and endocrine glands in Fishes.

Paper – 2 nd Fish Breeding and Hatchery Technology

- CO 1. Brood stock management of Fish and Prawn.
- CO 2. Breeding technology in Fishes and hybridization process.
- CO 3. Site selection, construction and their operation.
- CO 4. Water quality management in Fishes.
- CO 5. Ornamental Fishes in fresh water and marine water.

Paper – 3 rd Aquaculture

- CO1. Design, construction, history and scope of Aquaculture.
- CO2. All methods to use of pond management.
- CO3. Freshwater aquaculture in fishes.
- CO4. Commercial importance of sea weeds.



Class B.Sc 1st year

Title of the Paper (Course) Basic of Horticulture Course Code – 112-I

Course objective: Transfer knowledge of Horticulture especially branches, quality planting material (to develop Plant propagation skills) and other aspects.

CO1

1. Transfer knowledge of Horticulture in the field of agricultural research especially in horticulture including fruits, vegetables, flowers, spices, medicinal and aromatic plants and their management.

CO₂

- 1. Importance of fruit & seed, germination of seeds
- 2. Application of plant hormones in horticultural crops.

CO₃

1. Impart basic knowledge about the seed production ex. Seed quality, seed purity, vigour, seed treatment etc.

CO4

1. Educate to theory and practical of method of sowing, irrigation, drainage, manures and bio fertilizer etc.

CO5

1. Study of theory & practical aspect of plant propagation, seed propagation, vegetative propagation of horticultural crops and skill developed for self-employment in students.

Class B.Sc 1st year

Title of the Paper (Course) Fruit and Vegetable Production Course Code – 112-II

Course objective: Applied concepts of horticulture science to select, manage, and improve plants and their products

CO₁

- 1. Impart basic knowledge about the importance and management of various fruits crops.
- 2. Imparting knowledge about climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, postharvest management, plant protection measures in various fruit crops.

CO₂

- 1. Impart basic knowledge about the importance and management of various fruits crops.
- 2. Imparting knowledge about climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, postharvest management, plant protection measures in various fruit crops.

CO3

- 1. Educate production technology of vegetable crops.
- 2. Imparting knowledge about climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, postharvest management, plant protection measures in various of vegetable crops.

CO4

- 1. Educate production technology of vegetable crops.
- 2. Imparting knowledge about climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, postharvest management, plant protection measures in various of vegetable crops.

CO5

- 1. Educate production technology of flower crops.
- 2. Imparting knowledge about climatic and soil requirements, commercial varieties/hybrids, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting, postharvest management, plant protection measures in various of flower crops.

Department of Horticulture

Class B.Sc IInd year

Title of the Paper (Course) Establishment and management of orchard and nursery

Course Code - 212-I

Course objective: theory and practical knowledge use of tools, equipment and nursery, orchard and garden established & management

CO1

1. Impart basic knowledge & skill develops about the importance, establishment and management of orchard.

CO₂

- 1. Understanding the principle, theoretical aspects and developing skills in:
- -Landscape designs, its principles and practices of landscaping and
- -Ornamental Gardening structure features.
- -Protected cultivation of horticultural crops.

CO₃

- 1. Familiarization with principles and practices of propagation and nursery management for Horticultural Crops.
- 2. Knowledge of nursery establishment and management,

CO4

- 1. Identify and practice of horticulture tools
- 2. Describe common greenhouse design features and the materials used to build them

CO5

1. To identifying weeds associated with different horticultural crops and their preventing and controlling measures

Class B.Sc IInd year

Title of the Paper (Course) Farming Systems in Horticulture Course Code – 212-II

Course objective: Identify and sustainable practice of horticulture which benefit the environment while maintaining productivity

- CO1:-Educate the importance of sustainable horticulture farming and various system
- **CO2:-**Imparting basic knowledge about type of farming and their factors
- CO3:-Educate to theory and practical aspect of cropping system
- **CO4:-**Educate to theory and practical aspect of different cropping system and their interaction.
- **CO5:-**Various sources of farm power and their uses

Class B.Sc IIIrd year

Title of the Paper (Course) Soil Productivity & Agro forestry Course Code – 312-I

Course objective: Educate to theory and practical aspect of soil & their effect of crop production and agroforestry system

- **CO1:-**Teach the soil formation, composition, soil profile, soil properties.
- **CO2:-**Impart knowledge about various causes of soil erosion and control measures.
- **CO3:-**Principal of soil fertility, soil conservation methods, type of soil water.
- **CO4:-**To understand essentiality of plant nutrients and method of fertilizer application.
- **CO5:**-Educate to theory and practical aspect of agroforestry and their different system.

Govt. Holkar (Model, Autonomous) Science College ,Indore Department of Horticulture

Class B.Sc IIIrd year

Title of the Paper (Course) processing of horticulture crops & value addition) $Course\ Code-312\text{-}II$

Course objective: Educate to theory and practical aspect of Various methods of preservation of horticultural crops and skill development for self-employment

CO1

- 1. Understanding on principles and methods of fruit preservation of horticultural crops.
- 2. Study of post-harvest loss and their control.

CO₂

1. Teach the physiology and principle of fruit and vegetable preservation

CO3

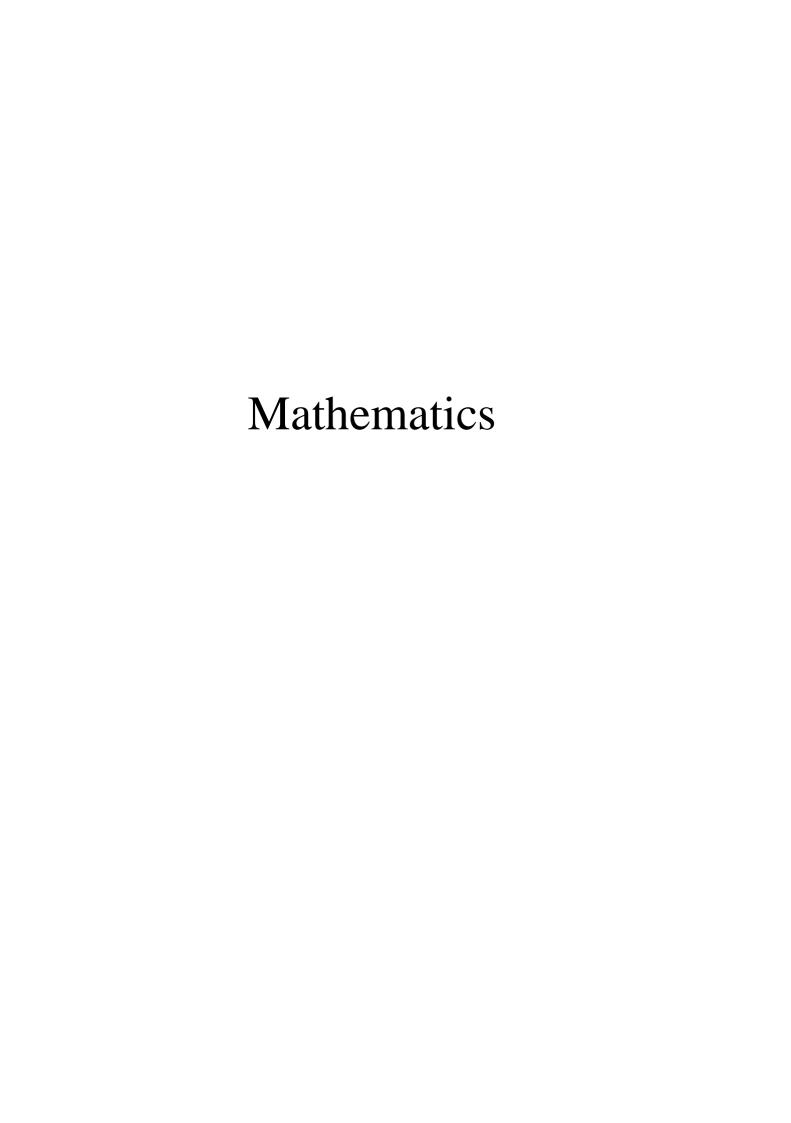
1. Educate Various methods of preservation of horticultural crops and value addition

CO4

1. Understandings the theoretical aspects and developing skills in biotechnology of horticultural crops

CO5

1 Harnessing bio-technology in horticultural crops, influence of plant materialsPractical application of tissue culture in horticultur



Govt. Holkar (Model, Autonomous) Science College, Indore Department of Mathematics

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Class : B. Sc. I Year

Title of the Paper : Algebra and Trigonometry

Course Code : 114 - I

Course Objective : The aim of this course is to develop the capacity to

solve mathematical

problems related to the Algebra And Trigonometry.

Students would be able to

CO 1 : Understand the basic concepts and the fundamental principle of the transformation of matrix which is useful to find rank of matrix.

CO 2 : Understand application of matrix to system of linear equations and Cayley - Hamilton's theorem.

CO 3 : Understand relation between roots and coefficient of polynomials and they become able to solve the theory of equations.

CO 4 : Identify symbolic logic and algebra of proposition, Boolean functions, switching circuits and its applications.

CO 5 : Understand the proof of De -Moivre's theorem and its applications, hyperbolic function, Gregory series and summation of trigonometric series.

Govt. Holkar (Model, Autonomous) Science College, Indore Department of Mathematics

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Class : B. Sc. I Year

Title of the Paper : Calculus and Differential Equations

Course Code : 114 - II

Course Objective : The main aim of this course is to introduced the expansion of

function by successive differentiation, curve tracing, integration of various

standard

forms and elementary differential equations.

Students would be able

CO1: To understand how to find out the successive differentiation by use of Leibnitz's theorem and expansion of a function through Maclaurin's and Taylor's theorem.

CO2: To sketch the various curves in Cartesian and polar coordinate system.

CO3: To understand the various methods of integration of standard forms, definite integral and its properties including important as the sum of limits.

CO4: To solve various differential equations of first order and first degree, first order and higher degree and their singular and general solutions.

CO5: To solve the linear differential equations with constant coefficient and second order by various methods.

Govt. Holkar (Model, Autonomous) Science College, Indore Department of Mathematics

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Class : B. Sc. I Year

Title of the Paper : Vector Calculus and Geometry

Course Code : 114 - III

Course Objective : The main objective of this course is to introduce and develop the

methods of vector analysis and how it helps with geometry and some physical concepts. They are also used as a tool in many theories of

applied mathematics.

Course Outcomes : Students would be able to understand

CO1: Content of this unit gave knowledge of scalar and vector triple product of four vectors. Study of gradient, divergence and curl helps the student to solve the derivation in Physics.

CO2: Vector integration process is used in solving the Gauss, Greens and Stock theorem. Problem based on these theorem is helpful to find relation between surface area to volume or line area to surface area.

CO3: Study of general equation of second degree helps the trace of parabola, ellipse and hyperbola other than standard form.

CO4: Equation of cone, generator of cone and right circular cone, cylinder is used to convert cylindrical shape to cone shape.

CO5: Central conicoid, Paraboloides, ellipsoid, hyperboloid help to generate a three dimensional view of parabola, ellipse and hyperbola.

Department of Mathematics

Year : 2021

Class: B. Sc. II Year

Title of the Paper: Abstract Algebra

Course Code: 214 - I

Course Objective: Group Theory is one of the building blocks of modern

algebra. Main objective of this course is to introduce students to basic concepts of Group, Ring theory and

their properties.

Students would be able

CO1: To recognize the mathematical objects called groups. This part provides a foundation in the basic concepts in the groups, subgroups and cyclic groups including properties.

CO2: To explain the significance of the notions of cosets, Lagrange's theorem and its consequences, normal subgroup and factor group.

CO3: To learn about structure preserving maps between groups namely homomorphism, isomorphism and its consequences, Permutation groups.

CO4: To utilize the class equation and Cauchy, sylow's theorems to solve related problems.

CO5: To provide information on rings, ideal and quotient ring, integral domain and Euclidean ring.

Department of Mathematics

Year : 2021

Class: B. Sc. II Year

Title of the Paper: Advanced Calculus

Course Code: 214 - II

Course Objective

: The course enables the students to understand the sequences and

series of

real numbers and their convergence. To acquire the knowledge of continuity and differentiability of functions of single variable, limit of functions of two variables, Partial differentiation. Also to get the knowledge of maxima and minima of functions, double and triple integrals. To enable the students of revolution and to evaluate volumes

and

surfaces of solid to know the change of order of double integral.

Course Outcomes : After completion the course Students will be able to

CO1 : Understand the convergence of sequences and series of real numbers which is

useful in a number of mathematical disciplines for studying functions, spaces

and

other mathematical structures.

CO2 : Understand the concept of continuity and differentiability of functions of a

single

variable and several important results.

CO3: Get knowledge of limit and continuity of functions of two variables, partial

differentiation, Taylor's theorem and Jacobians.

CO4: Evaluate maxima and minima of functions of two variables, envelopes and

evaluates, and get the knowledge of two very important functions namely beta

and

gamma functions.

CO5: Double and triple integrals and to evaluate them. To evaluate the volumes and

surfaces of solid revolution and also the change of the order of integrals.

Department of Mathematics

Year: 2021

Class: B. Sc. II Year

Title of the Paper: Differential Equations

Course Code: 214 - III

Course Objective : To introduce the students with the fundamentals of Ordinary

Differential

Equations, Partial Differential Equations and Laplace Transform.

Course Outcomes

CO1 : Students learn second order differential equations in particular Bessel's and Legendre's

equations using the Power series method.

CO2 : Students learn to find the Laplace transform of functions, their differential and integrals.

CO3 : Students learn to find the inverse of Laplace transform and by using it, solution of linear differential equation can be found.

CO4 : Students learn to solve PDE of first order using Lagrange's method, Charpit's method

and categorised PDE into standard forms.

CO5 : Students learn to solve PDE (homogeneous and non - homogeneous) of second and higher order with constant coefficients.

Department of Mathematics

Year : 2021

Class: B. Sc. III Year

Title of the Paper : Linear Algebra and Numerical Analysis

Course Code : 314 - I

Course objectives : Linear Algebra is a very important branch of Mathematics. In

this

course the students will learn about linear space, linear transformation, inner product space properties and their consequences. Also students will be able to know the various

methods of numerical analysis.

After the completion of this course the students would be able to

CO1: Understand the notion of abstract real and complex vector spaces (linear spaces), linear

combinations, independent and dependent vectors, basis and dimension of a vector space, extension theorem.

CO2: Discribe linear transformCation (L.T.) and its algebra, kernel,range,rank, nullity, matrix

representation, eigenvalues, eigenvectors of L. T., diagonalization

 $\ensuremath{\text{CO3}}$: Understand the notion of inner product space and its norm, Cauchy - Schwarz's

inequality, length of vector, orthogonal and orthonormal sets and basis, Gram - Schmidt orthonormalization process.,

CO4: Discuss various iteration methods, Lagrange interpolation, Newton - Cote's and Gauss

quadrature formulae.

CO5: Understand the various direct and iterative methods of solution of linear equations.

Department of Mathematics

Year: 2021

Class: B. Sc. III Year

Title of the Paper: Real and Complex Analysis

Course code: 314 - II

Course objectives: The main aim of this course is to provide students with the knowledge necessary for basic concepts in Real analysis such as Riemann

integration

and its properties, Improper integrals, Metric space, complex numbers and

its continuity and differentiability.

Students would be able to

CO1 : Understand Riemann sums and integral, fundamental theorem of calculus, mean value

theorems in integral calculus, Schwartz's ,Young 's implicit function theorems.

- CO2 : Understand first and second type of improper integrals and its convergence and divergence, and various integral tests, Fourier series.
- CO3 : Understand the notion of metric space and its preliminaries, Cauchy sequence, completeness and Banach contraction principle. Baire category theorem.
- CO4 : Discuss the continuity, uniform continuity and their results, compactness and connectedness of space.
- CO5 : The notion of complex numbers and, its limit and continuity, analytic function, C. R. equations, Mobius transformations, crosss ratio.

Department of Mathematics

Year : 2021

Class: B. Sc. III Year

Title of the Paper: Discrete Mathematics

Course Code: 314 - III

Course objectives :This course covers the basic concepts of discrete mathematics used in

computer science and other disciplines that involve the formal

reasoning.

The topics include logic, proof, relations, graphs, trees, and Boolean

Algebra.

Course outcomes : The student would be able to

CO1 : Understand the disjunctive and conjunctive normal form of a Boolean function, equivalence relation and partition of sets.

CO2 : Understand the posets, lattices and various types of lattices with examples.

CO3 : Understand the concept of graphs like connected, Euler, etc Hamiltonian path and circuits and algorithms for path.

CO4 : Understand trees and its type, rank and nullity of a graph.

CO5 : Understand the matrix representation of a graph, planar graph and its properties.

...

Class : M. Sc. I semester

Title of the Paper : Advanced Abstract Algebra - I

Course Code : M - 11

Course objective : This course provides students a foundation of advanced study of

Algebra. The topics covered normal, subnormal and composition

series,

extension fields, finite fields and other related concepts, Galois theory

and

its applications.

Students would be able to

CO1 : Understand normal, subnormal and composite series, Jordan - Holder's theorem, solvable and nilpotent groups.

CO2 : Understand algebraic and transcendental extension of fields, Eisenstein criterion of irreducibility and algebraically closed fields.

CO3: Understand normal and separable extension along with finite field, separable and inseparable extensions.

CO4: To discuss the fundamental theorems of Galois theory and algebra.

CO5: To explain the applications of Galois theory, roots of unity polynomial solvable by radicals.

Department of Mathematics

Year: 2021

Class: M. Sc. I semester

Title of the Paper : Real Analysis Course Code : M - 12

Course objective : The aim of this course is to explore the basics of Real Analysis about

the

real number system, sequences of functions and Riemann integrals.

Students would be able to

CO1 : Understand integrals and its properties, fundamental theorem of calculus.

CO2 : Know integration of vector valued functions, and Riemann's theorem.

CO3 : Develop the knowledge of sequence and series of functions, Riemann - Stieltjes integration and power series, Different tests.

CO4 : Know about functions of several variables, linear transformations, Taylor's theorem, inverse function theorem.

CO5 : Explain implicit function theorem, Jacobians, Differential of integral, Stoke's theorem.

...

Class : M. Sc. I semester
Title of the Paper : Topology - I
Course Code : M - 13

Course objective

theorems,

: To study the countable, uncountable set, cardinality and related

Topological spaces and elementary concepts, continuous functions,

countabality, connected spaces.

Students would be able to

CO1 : Understand countable and uncountable sets, cardinality and its arithmetic, including Schroeder - Berstein and Cantor's theorem.

CO2 : Understand the Basic notions of topological space and its properties, relative topology.

CO3 : Understand the continuity and homeomorphism in a various topological spaces.

CO4 : To recognize first and second countable space and related results.

CO5 : Discuss connected and path connected spaces including component of topological spaces.

Department of Mathematics Year : 2021

Class : M. Sc. I Semester Title of the Paper : Complex Analysis I

Course code : M - 14

Course objectives : The main aim of this course is to introduce and develop a clear

understanding of the fundamental concepts of complex analysis such

as

complex integration and related results, calculus of residues, bilinear

transformations.

Students would be able to

CO1 : Understand various theorems and formulae of Cauchy, Goursat, Poission etc.
 CO2 : Discuss the applications of Cauchy's theorem and integral formula, Morera's,

Liouville's, Taylor's and Laurent's theorems.

CO3: Understand the maximum modulus principle, Schwarz's lemma, zeros and

singularity of analytic function and related results.

CO4: Utilize the Cauchy's residue theorem and its applications.

CO5 : Understand the notion of elementary transformations, conformal Mappings.

Department of Mathematics

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Class : M. Sc. I semester

Title of the Paper : Advanced Discrete Mathematics - I

Course Code : M - 15

Course objective : The aim of this course is to prepare students to develop mathematical

arguments required to learn computer sciences courses. Also the basic

concepts of graph theory such as planar graph, Eulerian graph,

cycles,

trees and matrix representation of graphs are also introduced.

Students would be able to

CO1 : Understand the theory of semigroups, various structures of semigroups,

homomorphism of semigroups and direct product.

CO2 : Understand lattices and its properties, direct product, some special lattices e.g.

complimented and distributive etc.

CO3 : Discuss Boolean algebra, various Boolean forms, Boolean functions and types,

applications of Boolean algebra.

CO4 : Understand the elementary concepts of Graph theory along with planar graph

and

its properties, trees.

CO5 : Discuss Euler's formula for connected planar graphs, special trees and its

uses,

Kruskal's algorithm'.

...

Class : M. Sc. II semester

Title of the Paper : Advanced Abstract Algebra - I

Course Code : M - 21

Course objective : To develop skills and to gain knowledge on some of the

basic concepts in

theory of Modules and linear transformations.

Students would be able to

CO1 : Understand the concept of modules, submodules, direct sums, cyclic and quotient modules, along with homomorphism

CO2 : Understand completely reducible modules, free modules, linear mapping and its rank.

CO3 : Discuss noetherian and artinian modules and rings, Hilbert's and Weddeburn's theorem.

CO4 : Discuss the uniform, primary and finitely generated modules over a PID and applications to finitely generated abelian groups.

CO5 : Understand the concepts of linear transformation and its algebra, canonical and triangular forms, generalized Jordan form.

...

Class : M. Sc. II semester

Title of the Paper : Lebesgue Measure and Integration

Course Code : M - 22

Course objective : The aim of this course is to introduce Lebesgue theory of

measure and

integration which extends the familiar notions of volume and area

under

a graph associated with Riemann Integral. It will be demonstrated the

Lebesgue integral.

CO1 : Understand Lebesgue outer measure, Measurable sets, Regularit, Measurable functions

and Non - Measurable sets.

CO2 : Define integration of Non - negative functions, integration of series, Riemann integrations.

CO3 : Get an idea of the four derivatives, functions of bounded variation, differentiation and

integration.

CO4 : Know about spaces, convex functions, Jensen's, Holder's and Minkowski's inequality.

CO5 : Understand about dual spaces, convergence in measure. Uniform convergence and almost uniform convergence.

Department of Mathematics

Year : 2021

Class : M. Sc. II semester Title of the Paper : Topology - II

Course Code : M - 23

Course objective : To study the separation axioms and various types of compactness,

Tychonoff product of different topological spaces, Nets and filters,

and

elementary homotopy theory.

Students would be able to

CO1 : Understand the separation axioms and inter-relationship, distinguish Urysohn's Lemma

and the Tietze extension theorem.

CO2 : Discuss various compactness like countably compact, sequentially compact, local compact in a metric and topological spaces.

CO3 : Discuss the arbitrary product of different topological spaces and Tychonoff's theorem

CO4 : Discuss net and filters and their properties and results.

CO5 : Understand the homotopy, path homotopy, fundamental group and fundamental theorem

of algebra.

...

Class : M. Sc. II semester Title of the Paper : Complex analysis - II

Course Code : M - 24

Course objective

: The main aim of this course is to enable the students for further

deeper

topics of complex analysis and it will provide basic topics needed for

students to pursue research in pure mathematics.

Students would be able to

CO1 : Understand the space of continuation function and its space, Arzela - Ascoli, Hurwitz's, Montel and Riemann mapping theorems.

CO2 : Understand the notion of inner product, Gamma function and properties, Riemann zeta

function, Runge's, Mittag - Leffler's theorems.

CO3 : Utilize entire function and its order, Jensen's inequality and formula, Hadamard factorization and three circle theorems, Borel's theorems.

CO4 : Understand the analytic continuation function its uniqueness and power series method,

Schwarz principle etc.

CO5 : Study the Harmonic function and related theorems as Bloch's , Little Picard, Montei

Caratheodory, Great Picard theorems etc.

Department of Mathematics

Year : 2021

Class: M. Sc. II semester

Title of the Paper: Advanced Discrete Mathematics - II

Course Code: M - 25

Course objective: The main object of this course is to introduce students

with the fundamental concepts of graph theory and its applications and how the problems can be modelled by graphs and physical systems by finite state

machines. Also formal languages are used to model language and to communicate with computers.

Students would be able to

CO1: Understand the elementary concepts of graph theory and the properties of trees. Dijkstra's and Washell's algorithms.

CO2: Understanding finite state machines and its functioning and equivalence, finite automata.

CO3: To study the non - deterministic finite automata and its equivalence along with Moore and Mealy machines.

CO4: Understand turing machine, grammar and language, derivations.

CO5: To utilize the sentential form, context free and sensitive grammar and languages, regular expressions, polish notations.

...

Class : M. Sc. III semester Title of the Paper : Functional Analysis - I

Course Code : M - 31

Course objective : To explore the concepts of normed linear spaces, Banach spaces,

quotient spaces, and relevance of operators, dual spaces.

Students would be able to

CO1 : Understand the normed linear space, Banach space and their properties.

CO2 : Discuss finite dimensional normed linear spaces and its properties along with the

Riesz

lemma.

CO3 : Understand the quotient space of a normed linear space, linear operators with

properties.

CO4 : Understand the normed, bounded and continuous linear operators.

CO5 : Understand the theory of bounded linear functional and dual spaces.

...

Class : M. Sc. III semester

Title of the Paper : Advanced Special Functions - I

Course Code : M - 32

Course objective : This course is designed not only for professionals, mathematicians,

Physicists, engineers and chemists, but also for well trained graduate students, even research workers in special functions may notice, however, some results or techniques which he / she is not already

familiar with.

Students would be able to

CO1 : Understand Euler constant, the Euler product, Weierstrass definition Gamma function,

the beta function, the fractional function, Legendre and Gauss multiplication formula.

CO2 : Get knowledge of hypergeometric function, integral representation of hypergeometric

function, the continuous function relations etc.

CO3 : Understand generalized hypergeometric functions, the exponential and binomial

CO4 : Get an idea of Bessel function, index half an odd integer, Bessel's d Taylor's differential equation.

CO5 : Get knowledge of the confluent hypergeometric function, Kummer's formulae, orthogonal polynomials, expansion of polynomials.

...

Class : M. Sc. III semester

Title of the Paper : Advanced Fuzzy Mathematics - I

Course Code : M - 33

Course objective : After the completion of the course, the students will be able to learn

About various terminologies important in fuzzy mathematical Programming, Fuzzy Decision and Fuzzy Operators in Fuzzy

Mathematical Programming

Students would be able to

CO1 : Define a Fuzzy set membership function, representation of member function, support,

height equality of two Fuzzy sets.

CO2 : Get an idea of union and intersection of two Fuzzy sets, compliment of Fuzzy sets, Normal Fuzzy sets, Fuzzy cardinality.

CO3 : Understand important operation in Fuzzy product of two Fuzzy sets, Power of Fuzzy

sets, difference of two Fuzzy sets.

CO4 : Development an understanding general properties of operations and Fuzzy sets, Important theorem in Fuzzy sets.

CO5 : Know about comparison of α - cut and strong α - cut of compliment of Fuzzy sets.

...

Class : M. Sc. III semester Title of the Paper : Operations Research - I

Course Code : M - 34

Course objective : To understand mathematical techniques to optimize cost and time for

market and society.

CO1 : To understand operations research origin development and characteristics.
 CO2 : Various models of operations research. Linear programming, mathematical

formulations.

CO3 : Methods for linear programming.

CO4: To solve by simplex method. Big M, two phase method.

CO5 : To understand Duality and its characteristics.

...

Class : M. Sc. III semester

Title of the Paper : Analytic Number Theory - I

Course Code : M - 35

Course objective : Analytic Number theory is a branch of number theory which uses to

investigate various properties of positive Integers. The course enable

the

students to acquire the knowledge of basic concepts of arithmetical

functions. Dirichlet multiplication and average of

arithmetical functions.

Also to get the knowledge about Dirichlet characters, Dirichlet

theorem

on primes in a given arithmetic progression. To understand the

concept

of Dirichlet series and its absolute convergence. After completion of

this

course students will about able to understand

CO1 : Several arithmetic functions, their multiplication which are used throughout the syllabus. Also some important results on average of arithmetical functions.

CO2 : Characters of a group, group of characters and the orthogonality relation for characters.

CO3 : Dirichlet characters, sums involving Dirichlet's characters, non - vanishing Dirichlet L - function.

CO4 : Dirichlet theorem on primes in arithmetic progression.

CO5 : Dirichlet series and its absolute convergence, multiplication of two Dirichlet series

and Euler products.

...

Class : M. Sc. IV semester Title of the Paper : Functional Analysis - II

Course Code : M - 41

Course objective : The aim of this course is to develop a deeper and rigorous

understanding of functional analysis, their properties.

Students would be able to

CO1 : Understand uniform boundedness theorem, open mapping theorem and its applications,

closed graph theorem.

CO2 : Utilize Hahn - Banach theorem for real and complex normed linear spaces.

CO3 : Discuss reflexive and Hilbert spaces with properties, orthonormal sets, Parsval's and

Bessel's inequality.

CO4 : Discuss the projection mapping, projection and Riesz representation theorems.

CO5 : Explain the adjoint of operator and reflexivity in Hilbert space, and variety of operators.

...

Class : M. Sc. IV semester

Title of the Paper : Advanced Special Functions - II

Course Code : M - 42

Course objective : This course is designed not only for professionals,

mathematicians, Physicists, engineers and chemists, but also for well

trained graduate Students. Many of the standard concepts and

methods

which are Useful in the detailed study of special functions are

included.

Students would be able to

CO1 : Get an idea of the generating function concept, another class of generating functions,

properties of many polynomial sets.

CO2 : Understand Legender's polynomials, Bateman's generating functions, hypergeometric

form of Legender's polynomials, special properties of Legender's polynomials.

CO3 : Get knowledge of Hermite polynomials, expansion of polynomials, more generating

functions, recurrence relations.

CO4 : Understand Laguree polynomials, generating functions, recurrence Relations, expansion of polynomials, special properties of Leguree polynomials.

CO5 : Get an idea of Jacobi polynomials, Bateman's generating function, The Rodrigues formula, orthogonality, mixed relations.

...

Class : M. Sc. IV semester

Title of the Paper : Advanced Fuzzy Mathematics - II

Course Code : M - 43

Course objective : After the completion of the course, the students will be able to learn

About Linear Programming with Fuzzy Resources and objective with Fuzzy parameters in the objective function & Imprecise Coefficients.

Students would be able to

CO1 : Define convex Fuzzy sets, types of Fuzzy sets. Further operation on Fuzzy sets, cartesian product, Algebraic product.

CO2 : Understand extension principle and application image, inverse image of Fuzzy sets, product and division of Fuzzy numbers.

CO3 : Apply Fuzzy relation on Fuzzy sets. The union and intersection of Fuzzy sets. CO4 : Understand about Fuzzy graph, Fuzzy subgraph, path of Fuzzy Graph, Fuzzy function

on Fuzzy sets, Fuzzy function.

CO5 : Develop knowledge of Fuzzy logic, its connective. Tautologies Contradiction. Logical connective for Fuzzy logic. Linguistic hedges Fuzzy quantifiers.

...

Class : M. Sc. IV Semester Title of the Paper : Operations Research - II

Course Code : M - 44

Course objective : To understand mathematical models for market to optimize cost and

time.

CO1 : Solve replacement problems Money value present worth fractional

Discount ratio.

CO2 : Solve assignment problem mathematical formulation.

CO3 : Understand and solve transformations problems Northwest corner method Least cost

method.

CO4 : To learn network analysis construction of network technique and advances of the

network.

CO5 : To develop an idea for Game theory Solution by Linear programming Non Linear

programming technique.

...

Class : M. Sc. IV semester

Title of the Paper : Analytic Number Theory - II

Course Code : M - 45

Course objective : The course enable the students to acquire the knowledge of Dirichlet

-

series which play an important role in analytic number theory. The course studies most usually Riemann Zeta function, Dirichlet - series. Bernoulli numbers. Upon completion this course students would be

able

to understand

CO1 : The convergence of Dirichlet - series and its analytic properties.

CO2 : The mean value formula, an integral formula for the coefficient of Dirichlet - series. Also the basic concepts of Hurwitz zeta function.

CO3 : Riemann Zeta function and Dirichlet L - functions. Hurwitz zeta Functions and its integral representation.

CO4 : Analytic continuation of Hurwitz zeta functions, Reimann zeta function and Dirichlet

L - functions. Hurwitz's formula and the fundamental equations.

CO5 : Bernoulli polynomials and Bernoulli numbers and their properties.

...

Class : B.C.A. I semester Title of the Paper : Mathematics I

Course Code : 151

Course objective : The aim of this course is to understand the concept Of basic

mathematical methods of matrices, complex numbers and differential calculus. To apply methods to solve engineering problems. To analize

engineering problems and evaluate.

Students would be able to understand

CO1 : The concept of function of one variable and limits, fundamental properties of limits.

CO2 : Successive differentiation, Rolle's mean value and Taylor's theorems.

CO3 : About Normal, curvature, asymptotes, and integration of hyperbolic function.

CO4 : About vector function and its applications, partial derivatives.

CO5 : The basic concepts and the fundamental principles of the transformations of matrices

which is useful to find rank of matrices.

...

Class : B.C.A. II semester Title of the Paper : Mathematics II

Course Code : 251

Course objective : The objective of this course is to help students to gain knowledge

about

advanced calculus. Students learn

Students would be able to understand

CO1 : To trace curves (cartesian and polar form) and test convergence of improper integrals.

CO2 : About gamma and beta functions.

CO3 : To evaluate multiple integrals in finding areas and volumes. Also they learn vector integration and their applications.

CO4 : To find limit, continuity, and differentiability of functions of several Variables. Also

they learn partial derivatives and mean value theorems.

CO5 : To find maxima and minima of functions of two and three variables. Also, they learn tests to find convergence and divergence of series.

...

Class : B.C.A. II semester
Title of the Paper : Discrete Mathematics

Course Code : 351

Course objective

: The objective of this course is Syllabus cover algebra of Logic,

Boolean

Algebra and its properties, sets and Functions Mathematical

reasoning,

Combinatories used to develop computer programs and code in

language

of software development, Relation on set and Graph theory Language

and Grammers are useful in the development of hardware of

computer

system.

Students would be able to understand

CO1 : To understand algebra of Logic, Tautologies contradiction and programming language.

Boolean Algebra is bone to develop binary code for computer.

CO2 : Introduction to set theory, operations and Mathematical reasoning explained in this unit. It is used to solve different problem.

CO3: Provide knowledge of basics of counting. The sum rule, the product rule Pigen hole Principle permutations with repetitions. Applications of combination to solve committee problems, word problems etc.

CO4 : Knowledge of Relation Importance of relation in computer science. Types of relation

and their applications is basis of this unit.

CO5: Graph theory is useful in time scheduling problem. In this unit student learn terminology of graph, types of graph, graph coloring, Tree and its properties.

Language and Grammar is the basis for development of programming Language.

...

Class : B.C.A. II semester

Title of the Paper : Linear Algebra and Geometry

Course Code : 551

Course objective : To introduce the students with concepts of Linear Algebra and Three

Dimensional Geometry.

Students learn

CO1 : About Graphs, subgroups, normal subgroups, quotient group and their properties.

CO2 : About vector spaces, quotient space and their properties.

CO3 : Matrix representation of a linear transformation, its rank and nullity and eigenvalues

and

eigenvectors.

CO4 : About elliptical and hyperbolic paraboloid, ellipsoid and tangential

planes.

CO5 : About cones and enveloping cylinders of conicoid.



	Govt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Microbiology	
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	Class-M.Sc. Ist SEMESTER	
Ti	itle of the Paper (Course): Bacteriology Course Code: MB-11	
Course	Course Objective: To study and identify the basic structure of bacteria and methods of cultivation, staining and control of bacteria.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
	Course Outcomes	
CO1	Students will study and learn to identify the basic structure of bacteria.	
CO2	Students will study and learn about the growth phases of bacteria	
CO3	Students will study and learn the methods of cultivation of bacteria.	
CO4	Chemical and physical control methods for bacteria.	
CO5	Various staining techniques for bacterial structure.	

	Govt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Microbiology	
	•••	
	Class-M.Sc. Ist SEMESTER	
	Title of the Paper (Course): Virology Course Code: MB-12	
	Course objective: To understand the basic idea of structure of viruses, life cycle of bacteriophage, classification of fungi and cultivation of Algae.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
	Course Outcomes	
CO1	Students will understand the basic idea of structure of viruses.	
CO2	Students will study the life cycle of bacteriophage.	
CO3	Understand the concept of cultivation of virus and quantification.	
CO4	Students will learn general characters of fungi with classification.	
CO5	Understand the basic characters of Algae and cultivation.	

Govt. Holkar (Model. Autonomous) Science College, Indore		
Department of Microbiology		
	•••	
Class-M.Sc. Ist SEMESTER		
T	itle of the Paper (Course): Immunology Course Code: MB-13	
C	Course Objectives: To study the various method of vaccine production and immunological techniques.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
Course Outcomes		
CO1	Students will study and learn the various methods of vaccine productions.	
CO2	Students will study the mechanism of antibody generation and role of immunoglobulins in immunity.	
CO3	Understanding of various immunological techniques.	
CO4	Understanding of the mechanism, diagnosis and treatment of Cancer.	
CO5	Understanding of the mechanism of development of hypersensitivity reactions.	

Govt. Holkar (Model. Autonomous) Science College, Indore		
Department of Microbiology		
Class-M.Sc. Ist SEMESTER		
Ti	Title of the Paper (Course): Microbial Biochemistry Course Code: MB-14	
Cour	Course Objective: To study and learn structure and function of carbohydrate, protein, lipids, enzymes and vitamins.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
Course Outcomes		
CO1	Students will study and learn about structure, classification, identification and Properties of carbohydrates.	
CO2	Study and learning about structure, classification, identification and Properties of lipids.	
CO3	Study and learning about structure, classification, identification and Properties of Amino acids and proteins.	
CO4	Importance of enzymes as biocatalyst and its kinetic.	
CO5	Role of vitamins and their chemistry in living organism.	

Govt. Holkar (Model. Autonomous) Science College, Indore		
Department of Microbiology		
	•••	
	Class-M.Sc. IInd SEMESTER	
	Title of the Paper (Course): Microbial Genetics Course Code: MB-21	
Cour	Course Objective: To study the mechanism of DNA replication, DNA repair pathway, Operon concept and Gene transfer.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
	Course Outcomes	
CO1	Students will study and learn the mechanism of DNA replication in prokaryotes and eukaryotes.	
CO2	Understanding of different types of Mutation and DNA repair pathways.	
CO3	Studying the process of protein synthesis in prokaryotes and eukaryotes	
CO4	Learning about Operon concept.	
CO5	Knowledge about various mechanism of Gene transfer such as transduction, transformation and conjugation.	

	Govt. Holkar (Model. Autonomous) Science College, Indore	
Department of Microbiology		
	Class-M.Sc. IInd SEMESTER	
Т	Title of the Paper (Course): Microbial Physiology Course Code: MB-22	
C	Course Objective: To study the bacterial photosynthesis, pathways of bacterial metabolism and application of extremophiles.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
Course Outcomes		
CO1	Studying and learning about the mechanism of bacterial photosynthesis.	
CO2	Students will learn various metabolic pathways.	
CO3	Understanding of the lipid metabolism pathways.	
CO4	Importance of polysaccharides and biopolymers as cell components.	
CO5	Application of extremophiles and molecular methods for the study of microbial diversity.	

Govt. Holkar (Model. Autonomous) Science College, Indore		
Department of Microbiology		
Class-M.Sc. IInd SEMESTER		
	Title of the Paper (Course): Instrumentation Course Code: MB-23	
Co	Course Objective: To study and learn various techniques such as electrophoresis, chromatography and microscopy.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
Course Outcomes		
CO1	Studying about working, principle and applications of various types of microscopy.	
CO2	Learn basic working, principle and applications of various types of instrumentation of centrifugation.	
CO3	Understanding of the working, principle and applications of various types of chromatography techniques.	
CO4	Comprehend basic theory and instrumentation of electrophoresis and spectroscopy.	
CO5	Learning of the various radioisotopes techniques.	

	Govt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Microbiology	
	Class-M.Sc. Hnd SEMESTER	
Tit	Title of the Paper (Course): Fermentation Technology Course Code: MB-24	
Cour	Course Objective: To study and learn the screening methods of industrially important microorganisms and their role in various fermentation technology.	
On c	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.	
	Course Outcomes	
CO1	Learning about various methods of screening of microorganisms, strain improvement, inoculum development and media for industrially important microbes.	
CO2	Comprehend the procedure of harvesting and recovery of commercially product.	
CO3	Know about basic design of fermentor and factors affecting growth and production.	
CO4	Microbial production of commercially importance products such as solvents, organic enzymes.	
CO5	Microbial productions of commercially importance such as antibiotics, vitamins amino acids.	

	Govt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Microbiology	
	•••	
	Class-M.Sc. IIIrd SEMESTER	
	f the Paper (Course):Molecular Biology and Genetic Engineering Course Code: MB-31	
Cours	e Objective: To study and understand the molecular techniques, Gene mapping, DNA isolation, DNA sequences and Gene cloning.	
On	completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.	
	Course Outcomes	
CO1	Knowing the terms and terminology related to molecular biology and understanding the structure and functions of genes in living organism at the molecular level.	
CO2	Understanding the cloning strategies for construction of gene library.	
CO3	Studying about gene amplification – PCR and its applications.	
CO4	Importance of Hybridization techniques.	
CO5	Learning the concept of recombination, linkage mapping and elucidate the gene transfer mechanism in prokaryotes and eukaryotes.	
	Govt. Holkar (Model. Autonomous) Science College, Indore	
	Department of Microbiology	
	•••	
	Class-M.Sc. IIIrd SEMESTER	
	f the Paper (Course): Medical Microbiology Course Code: MB-32	
Cou	rse Objective: This course provides learning opportunities in the basics principles of medical microbiology and infectious diseases.	
On	completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.	
	Course Outcomes	
CO1	Learning the basic concept of pathogenic microorganism and the mechanism by which they disease in human body.	
CO2	Understanding the importance of bacteria in human disease with respect to infections of the respiratory tract, gastrointestinal tract, urinary tract.	
CO3	Understanding the concept of pathogenicity & toxigenicity.	
CO4	Development of diagnostic skills an interpretation of laboratory test in the diagnosis of diseases.	
CO5	Studying about various fungal & Viral infections.	

Govt. Holkar (Model. Autonomous) Science College, Indore			
	Department of Microbiology		
Class-M.Sc. IIIrd SEMESTER			
Title of the Paper (Course): Biostatistics and Computer applications Course Code: MB-33 A			
Cours	Course Objective: To study and understand the concept of data representation, probability and applications of computer.		
On	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
	Course Outcomes		
CO1	Understanding different types of data and its representation		
CO2	Calculation and understanding the measure of central tendency and variability.		
CO3	Studying and learning about different test of significance and probability theories.		
CO4	Learn about basics of computer and its organization.		
CO5	Understanding networking fundamentals and MS office.		

	Govt. Holkar (Model. Autonomous) Science College, Indore		
	Department of Microbiology		
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	Class-M.Sc. IIIrd SEMESTER		
Title of	f the Paper (Course): Microbial Ecology Course Code: MB-33 B		
Course	Course Objective: To study and learn types of ecosystem, microbial interaction and utility of microbes in sustainable development.		
On	On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
	Course Outcomes		
CO1	Studying various types of Ecosystems.		
CO2	Calculate diversity index and their practical application in ecological studies.		
CO3	Learning about hardy-Weinberg law of equilibrant of ecology and factors affecting it.		
CO4	Study about microbial interaction with human and plants.		
CO5	Role of microbiology in sustainable development.		

Govt. Holkar (Model. Autonomous) Science College, Indore			
Department of Microbiology			
	•••		
Class-M.Sc. IIIrd SEMESTER			
Title of the Paper (Course)Bioinformatics, Proteomics and Genomics Course Code: MB-34 A			
Cours	Course Objective: To study and understand about biological databases, sequence, searching tool and sequence alignment.		
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.			
	Course Outcomes		
CO1	Studying and learning about various biological databases.		
CO2 Understanding different algorithms and searching tools for nucleotide and protein sequence.			
CO3	3 Importance and construction of phylogenetic trees.		
CO4	Learning of gene expression analysis by DNA microscopy.		
CO5	CO5 Various techniques on proteome analysis.		

Govt. Holkar (Model. Autonomous) Science College, Indore			
	Department of Microbiology		
	•••		
	Class-M.Sc. IIIrd SEMESTER		
Title of	f the Paper (Course): Agriculture Microbiology Course Code: MB-34 B		
Course Objective: To study the methods of production of biofertilizer, development of resistant varieties and relationship between plant and pathogen.			
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.			
	Course Outcomes		
CO1	Learning methods of production of biofertilizer by using bacteria, fungi and cynobacteria.		
CO2	Studying the concept and relation between plant and pathogen in development of disease.		
CO3	Understanding the process of development of transgenic resistance varieties.		
CO4	Studying about different types of plant diseases caused by fungi, bacteria & virus.		
CO5	Comprehending the various control method of plant diseases and importance of microorganism in organic farming.		

Govt. Holkar (Model. Autonomous) Science College, Indore			
Department of Microbiology			
	•••		
Class-M.Sc. IIIrd SEMESTER			
Title of	f the Paper (Course): Basics of Microbiology Course Code: OE-BM		
Course Objective: To learn about the basics of microbiology including the scope, instruments used, culture and preservation, characteristic of microbes and their control.			
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.			
Course Outcomes			
CO1	Study of major contributions in the history, branches of microbiology and effects of microbes.		
CO2	Knowledge regarding instruments used in microbiology lab.		
CO3	Learning various techniques of microbial culture and preservation.		
CO4	To study the general characteristics of Bacteria, Algae, Virus and Fungi.		
CO5	Learning the concept of control of microorganism and various methods.		

Govt. Holkar (Model. Autonomous) Science College, Indore			
Department of Microbiology			
	Class-M.Sc. IVth SEMESTER		
Title of	Title of the Paper (Course): Food and Dairy Microbiology Course Code: MB-41		
pre	Course Objective: To study the advance concepts of food microbiology including servation, production, quality control, microbial examinations and spoilage control.		
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.			
Course Outcomes			
CO1	Various food fermentation procedure for bread, vinegar, bear, wine. Study of mushroom cultivation, single cell protein, probiotics and GOMs.		
CO2	Studying food infection and food intoxications, and understand microbiological quality standard of food.		
CO3 Understanding the principle techniques of food preservation, and control of food spoilage.			
CO4 Comprehending various techniques using for microbiological analysis of milk and qual control.			
CO5 Understanding the applications of microbial enzymes in dairy industry and probiotics.			

Govt. Holkar (Model. Autonomous) Science College, Indore		
Department of Microbiology		
	Class-M.Sc. IVth SEMESTER	
Title of	the Paper (Course): Environmental Microbiology Course Code: MB-42	
	rse Objective: To study the occurrence and distribution of microbial diversity in air, vater and soil. Understand the concept of biopolymers, bioplastics, biosensors and biogeotechnology.	
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.		
Course Outcomes		
CO1	Learning the occurrence, abundance and distribution in air, and transmission of bacterial fungal and viral diseases through air.	
CO2	Understanding various biogeochemical cycles, carbon, nitrogen, phosphorus cycle, and plant microbes interaction specially rhizosphere and phyllosphere.	
CO3	Learning the various aspect of environmental microbiology including purification of water, waste water treatment and microbial analysis of water.	
CO4	Understanding the importance and application Immobilized enzymes.	
CO5	Role of microorganisms in Bioremediation, Biodeterioration. Bioleaching of metals, Microbial enhancement of oil recovery.	

Govt. Holkar (Model. Autonomous) Science College, Indore			
	Department of Microbiology		
			
	Class-M.Sc. IVth SEMESTER		
Title o	of the Paper (Course): Pharmaceutical Microbiology Course Code: MB-43 A		
Cour	Course Objective: To gain job opportunity in pharma industry and study various techniques of production of pharmaceutical products, spoilage and quality control.		
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.			
	Course Outcomes		
CO1	Exploring the role of microbiologist and job opportunities in pharma industry.		
CO2	Training and learning about different tests performed by microbiologist in pharma industry.		
CO3	CO3 Knowledge about antimicrobial agents and drugs.		
CO4	Learning of drug delivery systems, drug targeting and mode of antimicrobial agents.		
CO5	Knowledge about drug development in pharma industry and new vaccine technologies.		

Govt. Holkar (Model. Autonomous) Science College, Indore			
	Department of Microbiology		
	Class-M.Sc. IVth SEMESTER		
Title	Title of the Paper (Course): Biosafety and IPR Issues Course Code: MB-43 B		
Course Objective: To make the students aware about the various types of intellectual properties and standard biosafety levels.			
On completion of the course, the student will be aware and will be able to practice the different applications of IPR and biosafety levels in laboratories.			
Course Outcomes			
CO1	Awareness about patents, Trademarks, Copyright & Related Rights etc.		
CO2	Learning the concept of patent databases, analysis and report formation.		
CO3	Knowledge about basics of patents, filing of applications and role of country patent office.		
CO4	Guideline regarding patent filing and infringement.		
CO5	Knowledge regarding different biosafety levels, biosafety guideline and environmental release of GOMs.		

Govt. Holkar (Model. Autonomous) Science College, Indore			
Department of Microbiology			
	•••		
	Class-M.Sc. IVth SEMESTER		
Title of	f the Paper (Course): Bio-Nanotechnology Course Code: MB-44 A		
Course	e Objective: To make the students learn about the latest development in the field of bio nanotechnology with regards to its applications and instrumentation.		
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject and can pursue research related work in this filed.			
	Course Outcomes		
CO1	To understand the basic concepts of Nanotechnology in regards to health environment and society.		
CO2	Knowledge about different spectroscopic techniques involved in Nano technology.		
CO3	Knowledge about different spectroscopic techniques involved in Microscopic techniques.		
CO4	Learning about Nanoparticles and their synthesis.		
CO5	Exploring different applications of Nanobiology.		

	Govt. Holkar (Model. Autonomous) Science College, Indore		
	Department of Microbiology		
	•••		
	Class-M.Sc. IVth SEMESTER		
Title of	Title of the Paper (Course): Cell Biology Course Code: MB-44 B		
Course	e Objective: To learn about detailed structure of prokaryotic, plant and animal cell. In depth knowledge about the structure and function of cell organelles.		
On completion of the course, the student will be profound in complete Knowledge and Understanding of the subject.			
	Course Outcomes		
CO1	To study prokaryotic and eukaryotic cell structure along with cell wall, cell membrane composition.		
CO2	To study transport of metabolites access cell membrane.		
CO3	Structure of functions of mitochondria and chloroplast.		
CO4	Phases of cell cycle and cell division.		
CO5	To understand various cell signaling pathways.		



Course learning outcomes

Department of Pharmaceutical Chemistry

C116-I

The course would enable the students to develop the concept of pharmaceutical inorganic compounds and their application in daily life. This will provide a foundation for various applied fields in pharmaceutical chemistry. The students will be able to.

- C116-I-1Describe about preparation and properties of gastrointestinal and topical agents.
- C116-I-2 Explain the preparation, properties, identification and assay of dental products.
- C116-I-3 Describe role of physiological ions, physiological acid base balance and electrolytes.
- C116-I-4 Describe role of physiological ions, physiological acid base balance and electrolytes.

C116-II

The course would enable the students to develop the concept of pharmaceutical organic compounds and their application in daily life. This will provide a foundation for various applied fields in pharmaceutical chemistry. The students will be able to

C116-II-1 Describe the basic concept about pharmaceutical organic chemistry. C116-II-2 Explain the stereochemistry and reaction mechanism of organic compounds. C116-II-3 Demonstrate reaction mechanism and application of organic reactions

T116-II

The course would enable the students to develop the concept of pharmaceutical organic compounds and their application in daily life. This will provide a foundation for various applied fields in pharmaceutical chemistry. The students will be able to

T116-II-1 Describe the basic concept about pharmaceutical organic chemistry. T116-II-2 Explain the stereochemistry and reaction mechanism of organic compounds. T116-II-3 Demonstrate reaction mechanism and application of organic reactions.

O116-I

The course would enable the students to develop the basic concept of pharmaceutical chemistry and their application in daily life. This will provide a foundation for various applied fields in pharmaceutical chemistry. The students will be able to

- O116-I-1 Describe the basic concept about pharmaceutical chemistry.
- O116-I-2 Explain the activities of pharmaceutical compounds.
- O116-I-3Demonstrate the concept of drug metabolism and pharmacokinetics in human body.

O116-II

The course would enable the students to develop the basic fundamentals of drug. This will provide an understanding of basic concepts of drug chemistry. The students will be able to O116-II-1 Understand the basic concept about drug chemistry.

- O116-II-2 Illustrate the active distribution of drugs in living organisms.
- O-116-II-3Demonstrate the concept of drug metabolism and activity of drugs.

216-I

After successful completion of this course students should be able to

- **216-I-1** Explain physicochemical properties of a pharmaceutical compound in relation to biological action.
- **216-I-2** Describe general anesthetics & local anesthetics ,their classification MOA, S AR synthesis uses adverse effects of some common compounds of these categories of drugs.
- **216-I-3** Describe hypnotics, sedatives & anti-convulsions their classification, MOA, SAR, synthesis, uses and adverse effects of some common compounds of these classes of drugs.
- **216-I-4** Describe analgesics, antipyretics and anti-histamines their classification, MOA, SAR, synthesis, uses and adverse effects of some common compounds of these classes of drugs.
- **216-I-5** Describe diuretics and anti-hypertensives, their classification, MOA, SAR, synthesis, uses and adverse effects of some common compounds of these classes of drugs. E run the

216-II

After successful completion of the course students should be able to

- **216-II-1** Explain heterocyclic compounds naturally present in plants and animals
- **216-II-2** Describe naturally present carbohydrates fats and oils and their pharmaceutical importance
- **216-II-**3 Explain amino acids, proteins and nucleic acids biologically present.
- 216-II-4 Explain naturally occurring alkaloids & glycosides and their pharmaceutical usage
- **216-II-5** Describe terpenes and their medicinal uses. Steroids as a biological & medicinal compound.

316 -I

After successful completion of this course students should be able to

- **316-I-1** Describe adrenergic anticoagulants, expectorants and antitussives agents their classification MOA, SAR, synthesis, uses and adverse effects of compounds of these categories of drugs.
- **316-I-2** Explain historical background, SAR classification of antibiotics and classification, MOA and synthesis of sulphonamides.
- **316-I-3** Explain MOA, SAR and classification of antimalarials. Anti tubercular drugs and antiamoebics.
- **316-I-4** Explain MOA classification of ant diabetics and antineoplastics, types of cancer.
- **316-I-5** Describe various approaches of drug design.

316 II

After successful completion of their course students should be able to

- **316-II-1** Describe conductometric ,potentiometric and polarographic methods with their instrumentation and applications.
- **316-II-2** Explain UV& IR spectroscopy with their principle. Instrumentation and applications.
- **316-II-3** Explain principles & instrumentation of NMR and mass spectroscopy and interpretation of NMR
- **316-II-4** Describe various types of chromatography and their applications.
- **316-II-5** describe various types of chromatography their instrumentation and applications. Ion beam A and a 20 to the

PC-11

After successful completion of this course students should be able to

- **PC-11-1**Explain coordination chemistry
- **PC-11-2** Explain nature of metal- legend bonding in complexes
- **PC-11-3** Describe reactions of mechanism of transition metal complexes.
- **PC-11-4** Explain dental products and various components used as a drugs.
- **PC-11-5** Explain bioinorganic chemistry in biological system.

PC -12

After successful completion of this course students should be able to

- **PC-12-1** Explain concept of stereo chemistry and conformational analysis.
- **PC-12-2** Describe mechanisms of various organic reactions.
- **PC-12-3** Explain concept of aromaticity & antiaromaticity.
- PC-12-4 Describe mechanisms of some molecular rearrangement reactions.
- **PC-12-5** Describe mechanisms of some reactions of synthetic applications.

Course Outcomes PC-13

After the successful completion of this course students should be able to

- **PC-13-1** Explain main complexation and protein binding.
- **PC-13-2** Explain kinetics of reactions and drug stability.
- PC-13-3 Explain diffusion & dissolution of drug compound
- **PC-13-4** Describe interfacial phenomena. & buffer system V.
- **PC-13-5** Explain micromeritics, and their importance.

PC-14

After successful completion of this course students should be able to

- **PC-14-1** Explain principle applications and interpretation of infrared spectroscopy
- **PC-14-2** Describe principle & instrumentation of NMR spectroscopy
- **PC-14-3** Describe Raman spectroscopy
- PC-14-4 Explain principle, instrumentation and applications of ESR Spectroscopy
- **PC-14-5** Describe theory, instrumental aspects and applications of AAS in pharmaceutical analysis.

PC-21

After successful completion of this course students should be able to

- **PC-21-1** Know the impurities in pharmaceutical substances.
- **PC-21-2** Describe Synthesis properties & uses of inorganic compounds as gastrointestinal and topical agents
- **PC-21-3** Explain synthesis, properties & uses of inorganic compounds of pharmaceutical importance
- **PC-21-4** Describe radiopharmaceuticals.
- **PC-21-5** Explain calcium and iron compounds as pharmaceutical agents.

PC-22

After successful completion of this course students should be able to

- PC-22-1 Explain classification of the drugs & drug receptors.
- **PC-22-2** Explain physicochemical properties in relation to biological action.
- PC-22-3 Explain preparation and uses of reagents used in organic synthesis.
- **PC-22-4** Describe synthesis, reactivity and chemical properties of heterocyclic compounds of biological significance.
- **PC-22-5** Explain addition to carbon hetero multiple bonds reactions.

PC-23

After successful completion of this course students should be able to

- **PC-23-1** Explain concept of rheology, properties and applications to pharmacy.
- PC-23-2 Describe coarse dispersions systems
- PC-23-3 Explain prodrug, drug carriers and routes of drug administration.
- **PC-23-4** Describe polymer on the basis of source and structure.
- **PC-23-5** Explain important features of bioactive polymers and their uses.

PC-24

After successful completion of this course students should be able to

- **PC-24-1** Explain chromatography like TLC, paper gas liquid in pharmaceutical analysis.
- PC-24-2 Explain chromatography like HPLC, Ion exchange & gel.
- **PC-24-3** Describe solvent extraction, types and applications.
- PC-24-4 Describe titrimetric and gravimetric methods of analysis.
- **PC-24-5** Explain principle instrumentation & applications of nephelometry, turbidimetry & flame photometry.

PC-31

After successful completion of the course students should be able to

- PC-31-1 Explain classification SAR, therapeutic uses and adverse effects of NSAID's
- **PC-31-2** Explain classification, SAR, MOA, synthesis, therapeutic uses and adverse effects of local & general anesthetics
- **PC-31-3** Describe classification synthesis, uses and adverse effects of antihypertensive & diuretic drugs .
- **PC-31-4** Explain classification, SAR synthesis, therapeutic uses and adverse effects of anti histaminics, antimalarials, and anti tubercular agents.
- **PC-31-5** Explain SAR synthesis, uses, and side effects of sulphonamids and antineoplastic agents.

PC-32

After successful completion of the course students should be able to

- **PC-32-1** Explain classification occurrence and methods of structure determination of terpenoids & carotenoids.
- **PC-32-2** Describe nomenclature, occurrence isolation & methods of structure elucidation of alkaloids.
- PC-32-3 Describe occurrence nomenclature and synthesis, of cholesterol,
- **PC-32-4** Explain occurrence, nomenclature, isolation and methods of structure determination of plant pigments and biosynthesis of flavonoids.
- PC-32-5 Explain occurrence classification of prostaglandins, pyrethroids and rotenones.

PC-33 (A)

After successful completion of the course students should be able to

- **PC-33** (A)-1 Describe toxicants, classification and importance of toxicology and carcinogenicity
- PC-33 (A)-2 Explain drugs of abuse their classification, tolerance and dependence.

PC-33 (A)-3 Describe poisons, their types and causes of poisoning.

PC-33 (A)-4 Explain detailed treatment of poisoning of substances like, morphine, alcohol & metals.

PC-33 (A)-5 Describe drugs & pregnancy and drug interactions.

PC-33 (B)

After successful completion of the course students should be able to .

PC-33 (B)-1 Explain basics of immunology and hypersensitivity.

PC-33 (B)-2 Describe vaccinology as per pharmaceutical considerations.

PC-33 (B)-3 Explain genetics and genetics code. Ion

PC-33 (B)-4 Explain gene cloning monoclonal antibodies and hybridona technology.

PC-33 (B)-5 Explain various approaches of gene therapy.

PC-34 (A)

After successful completion of the course students should be able to

PC-34 (A)-1 Explain introduction and classification of drugs from natural origin.

PC-34 (A)-2 Explain cultivation factors affecting cultivation and plant growth hormones.

PC-34 (A)-3 Describe biogenesis of carbohydrates, homoglycans and heteroglycans.

PC-34 (A)-4 Explain classification and biosynthesis of glycosides.

PC-34 (A)-5 Explain biomedicinals from plant tissue culture secondary metabolites and phytopharmaceuticals .

PC-34(B)

After successful completion of this course students should be able to

PC-34 (B)-1 Explain material handling systems & fluid flow.

PC-34 (B)-2 Explain filtration and centrifugation methods for extraction of pharmaceutical compound

PC-34 (B)-3 Explain surgical products and packaging of pharmaceutical product.

PC-34 (B)-4 Explain cosmetic science, and cosmetic preparations.

PC-34 (B)-5 Explain physical & chemical properties of drugs.

PC-35

After successful completion of this course students should be able to

PC-35-1 Explain biological functions of carbohydrates proteins & vitamins.

PC-35-2 Explain drugs & their types.

- **PC-35-3** Explain body fluids.
- **PC-35-4** Explain types of enzymes & hormones
- **PC-35-5** Explain some common diseases.

PC-41

After successful completion of this course students should be able to

- **PC-41-1** Explain types of diabetes, physiology of insulin and therapy of hyperthyroidism
- PC-41-2 Explain significance of drugs metabolism in medicinal chemistry
- **PC-41-3** Explain skeletal muscle relaxants, narcotic analyzers and anti cholinergic drugs.
- **PC-41-4** Explain classification MOA, SAR, therapeutic uses and side effects of immunosuppressant, anticoagulants and ant platelet drugs.
- PC-41-5 Explain ant parkinsonism, antihyperlipidemic, antifungal and antiulcer drugs.

PC-42

After successful completion of this course students should be able to

- **PC-42-1** Explain instrumentation, theory of FTIR and c¹³ NMR spectroscopy.
- PC-42-2 Explain theory instrumentation & applications of mass spectroscopy
- PC-42-3 Explain theory instrumentation and applications of fluorimetry and phosphorimetry
- PC-42-4 Explain immunoassay techniques.
- PC-42-5 Explain thermal methods & polarimetry

PC-43 (A)

After successful completion of this course students should be able to

- PC-43 (A)-1. Explain historical perspective, introduction to drug design & discovery.
- **PC-43** (A)-2 Describe three dimensional aided drug design and mechanism based drug design
- PC-43 (A)-3Explain pharmacophoric approach for drug designing
- PC-43 (A)-4 Explain fundamentals of QSAR
- PC-43 (A)-5 Describe significance of computers in medicinal chemistry

PC-43(B)

After successful completion of this course students should be able to

- PC-43 (B)-1 Describe neurohumoral transmission in CNS
- PC-43 (B)-2 Explain psychopharmacological agents.
- PC-43 (B)-3 Describe drugs acting in the gastrointestinal track.

PC-43 (B)-4 Describe drugs acting on the hematopoietic system.

PC-43 (B)-5 Explain autacoids.

PC-44- (A)

After successful completion of this course students should be able to

PC-44 (A)-1 Explain biopharmaceutics and methods of studying gastrointestinal absorption.

PC-44 (A)-2 Describe pharmacokinetics of the drugs.

PC-44 (A)-3 Explain compartment models of pharmacokinetic drug interactions.

PC-44 (A)-4 Explain clinical pharmacokinetics and their applications.

PC-44 (A)-5 Describe bioavailability & bioequivalence.

PC-44(B)

After successful completion of this course students should be able to

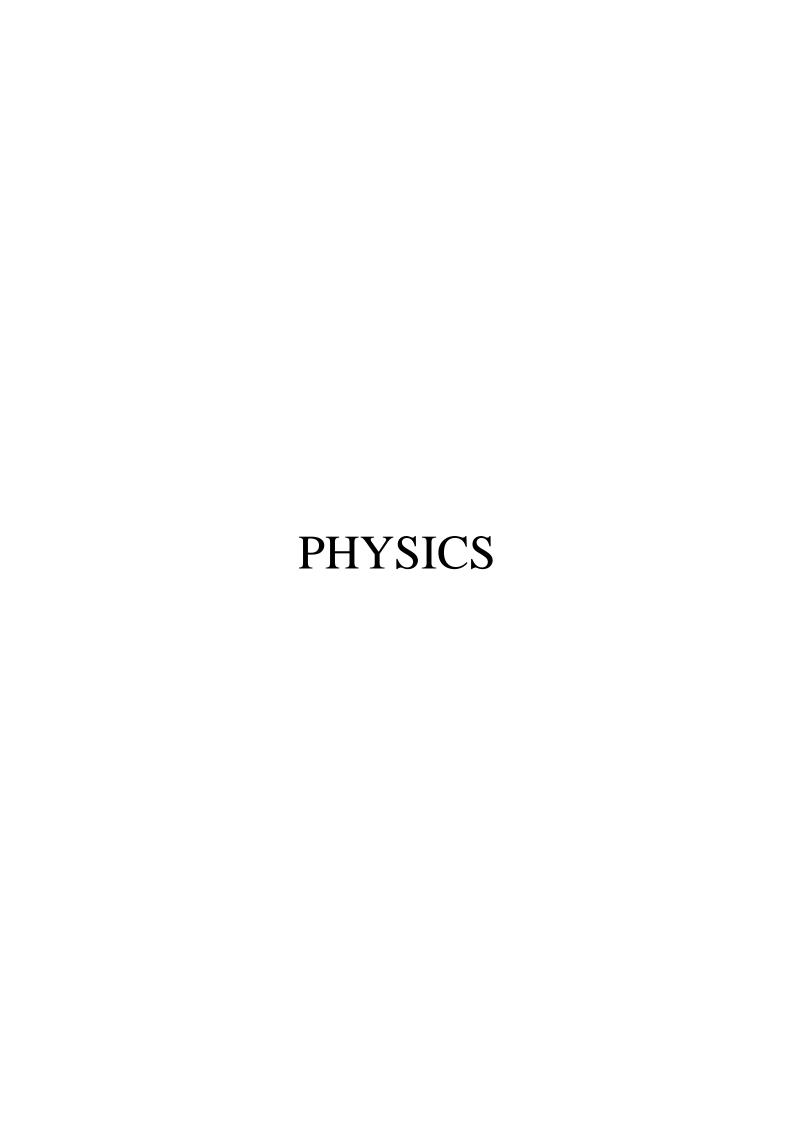
PC-44 (B)-1 Explain manufacturing & types of tablets

PC-44 (B)-2 Describe capsule dosage forms.

PC-44 (B)-3 Explain liquid & semisolid dosage forms

PC-44 (B)-4 Explain parenteral products and ophthalmic preparations

PC-44 (B)-5 Describe micro capsulation.



Department of physics

B.Sc I Year PAPER-I

Paper: Core (Major) ITitle of Paper: Thermodynamics and Statistical Physics (Paper-I

	Part - A		
	Introduction for Code - C117-I (T)		
	SUBJECT : PHYSICS		
2	Course Objectives	To study of application and principle based Thermodynamics and Statistical Physics in Science perspective.	
	Course Learning Outcomes	1. The course would in able the students to understand the basic physics of heat and temperature in relation to energy work, radiation and matter	
3		2. The Students are accepted to learn that "how loss of Thermodynamics are used in a heat engine to transform heat in to work"	
		3. The course will also develop an understanding of the various concepts of statistics and the methods to apply them in thermodynamics	
		4. Students will understand the importance of studying Statistical mechanics with the behaviour of Particles under classical and quantum conditions.	

B.Sc I Year PAPER -II

	Part - A Introduction for Code - C117-II (T) SUBJECT : PHYSICS		
2	Course Objectives	To study of application and principle based Mathematical physics, Mechanical Physics and Astrophysics in perception of science	
		The course would empower the students to develop the idea about the behaviour of physical bodies.	
3		2. It will provide the basic concepts related to the motion of all objects around us in daily life.	
	Course Learning Outcomes	3. The students would be able to build foundation in various applied field in science and technology especially in the field of mechanical engineering.	
		4. The Students will acquire the knowledge of basic mathematical methods to solve the various problems in physics.	
		5. The Students will be able the understand the relativistic effect and the relation between energy and mass.	

B.Sc II Year PAPER

Part - A Introduction for Code – C217-I (T) **SUBJECT: PHYSICS** To study of application and principle based Optical Physics in Science **Course Objectives** perspective. 1. The course would in able the students to understand the Different types of aberrations, achromatise and different types of eyepieces 2. The Students are learning about Interference and their applications **Course Learning Outcomes** 3. The Students are learning about Diffraction and their applications 4. The Students are learning about Polarization and their applications 5. The Students are learning about Basic principle, characteristics and application of laser.

B.Sc II Year PAPER-II

Part - A Introduction for Code - C217-II (T) **SUBJECT: PHYSICS** To study of application and principle based Electrostatics, Magneto **Course Objectives** Statics and Electrodynamics Physics in Science perspective. 1. The course would in able the students to understand magnetic effects of electric current. 2. The Students are learning about Laws of Magnetic Phenomena and applications **Course Learning** 3 **Outcomes** 3. The Students are learning about Network Circuits. 4. The Students are learning about EM Waves and Maxwell's equation and application

B.Sc III Year PAPER-I

Part - A Introduction for Code - C317-I (T)

	SUBJECT : PHYSICS		
1	Pre-requisite (if any)	To study this course, A student must have had the subject physics in II nd year	
2	Course Objectives	To study of principle and applications based Quantum Mechanics, Atomic and molecular Spectroscopy, Nuclear and elementary particle Physics.	
	Course Learning Outcomes	1. The course would in able the students to understand the elementary idea about Quantum Physics.	
3		2. The Students are learning about experimental and theoretical Atomic Spectroscopy model and application.	
		3. The Students are learning about experimental and theoretical Molecular Spectroscopy model and application	
		4. The Students are learning about Nucleus and their properties.	
		5. The Students are learning about the idea about Elementary particles.	

B.Sc III Year PAPER-II

Part - A Introduction for Code - C317-II (T)

SUBJECT: PHYSICS Pre-requisite To study this course, A student must have had the subject physics in IInd year (if any) To study of principle and applications based solid state physics and Electronics **Course Objectives** devices. 1. The course would in able the students to understand the elementary idea about Solid state physics and their principles. **Course Learning** 2. The Students are learning about the semiconductor devices and their 3 **Outcomes** applications. 3. The Students are learning elementary idea about the Nano materials and their properties.

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core I

Title of the Paper MATHEMATICAL PHYSICS

Paper Code- PH11

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To impart knowledge about various mathematical tools employed to study Physics problems.
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1: Get introduced to Bessel functions and their recurrence relations 2: Learn the fundamentals and applications of Fourier series, Fourier and Laplace Transforms, their inverse transforms etc., 3: Green's function and its application in boundary value problem 4: To know the method of contour integration to evaluate definite integrals of varying

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core II

Title of the Paper - CLASSICAL MECHANICS

Paper Code - PH12

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To impart knowledge about various fundamentals of classical mechanics to study Physics problems
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1: The Lagrangian and Hamiltonian approaches in Classical Mechanics 2: The Canonical transformation and H-J theory 3: C-F motion: equations of motion and first integrals, Kepler problem- inverse square law of force. 4: To know the method of contour integration to evaluate definite integrals of varying complexity 5: Theory of small oscillations in detail along with basics of Free vibrations.

Marks 75+25(CCE) =100

SUBJECT - PHYSICS

PAPER -Core III

Title of the Paper - QUANTUM MECHANICS- I

Paper Code - PH13

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To train the students in the physical interpretations of the wave functions, their asymptotic behavior, the energy Eigen values and Eigen functions etc.,
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1: Basics of Quantum mechanics and the Solution of Schrodinger equation for simple potentials 2: Application of Schrodinger's wave equation to study the Atomic, molecular spectra 3: Representation of state vectors and dynamical variables by Matrix and unitary transformations. 4: To understand various approximation methods in QM to solve non-exactly solvable problems, like Perturbation theory for stationary states. 5: To understand Matrix mechanism The Schrodinger's and Heisenberg picture.

Marks 75+25(CCE) =100

SUBJECT - PHYSICS

PAPER -Core IV

Title of the Paper - ELECTRONIC DEVICES

Paper Code - PH14

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To impart knowledge about various fundamental electronics devices
	After the completion of the course student will be able to understand the
	mechanism of the following:
	1: Behavior of special purpose diodes. I-V characteristics of MOSFET and other semiconductor
	devices
Course Learning Outcomes	2: Photonic devices
	3: Memory devices such as ROM,PROM, EPROM.
	4: Electro Magneto, and Acoustic optic effect.
	5: Contemporary integrated circuit amplifier design.

Marks 75+25(CCE) =100

SUBJECT - PHYSICS

PAPER -Core I

Title of the Paper - QUANTUM MECHANICS .II

Paper Code – PH21

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To give basics and preliminary knowledge of Quantum Mechanics and its mathematical details for computing observable physical quantities through examples.
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1. Approximation methods for time-independent problems like the WKB approximation 2. Perturbation theory and Interaction of an atom with the electromagnetic field 3. Theory of scattering and calculation of scattering cross section, optical theorem, Born and Oppenheimer approximation, Partial wave analysis etc. 4. Relativistic Quantum Mechanics using Dirac equation, Dirac matrices,. The Klein Gordon equation etc.

Marks 75+25(CCE) =100

SUBJECT - PHYSICS

PAPER -Core II

Title of the Paper - STATISTICAL MECHANICS

Paper Code – PH22

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
	To understand the properties of macroscopic systems using the knowledge of the
Course Objectives	properties of individual particle
	After the completion of the course student will be able to understand the
	mechanism of the following :
Course Learning	
Outcomes	 Use various ensemble theories to calculate the thermodynamic properties of different systems.
	Compute properties of systems behaving as ideal Fermi gas or Ideal Bose gas.
	3. Evolution of viral coefficient
	4. Thermodynamics fluctuation
	5. Classify transitions as first order or second order.

Marks 75+25(CCE) =100

SUBJECT - PHYSICS

PAPER -Core III

Title of the Paper - ELECTRODYNAMICS AND PLASMA PHYSICS Paper Code - PH23

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To understand the basics of Electrodynamics and Plasma Physics
	After the completion of the course student will be able to understand the
	mechanism of the following :
Course Learning	
Outcomes	1. To gain a clear understanding of Maxwell's equations and electromagnetic
	boundary conditions.
	2. To know that laws of reflection, refraction are outcomes of electromagnetic
	boundary conditions.
	3. To grasp the idea of electromagnetic wave propagation through wave
	guides and transmission lines.
	4. To Understand the rather complex physical phenomena observed in plasma
	5. Domain of Magneto Hydrodynamics

Marks 75+25(CCE) =100

SUBJECT - PHYSICS

PAPER –Core IV

Title of the Paper - ATOMIC AND MOLECULAR PHYSICS

Paper Code – PH24

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
	This course will provides an introduction to the knowledge of the different
Course Objectives	spectroscopic methods
	After the completion of the course student will be able to understand the
	mechanism of the following :
Course Learning Outcomes	Atomic Spectra of alkali elements
	2. X-Ray and Rotation Spectra
	3. Vibrational spectra and IR Spectrometer
	4. Understand the theory and nature of Raman spectroscopy and its
	applications
	5. Zeeman and Paschen back effect

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core I

Title of the Paper: CONDENSED MATTER PHYSICS-I PAPER Code- PH31

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	Course Objectives : To train the students in various methods like X-ray diffraction to understand the structure and symmetry of crystalline materials. • To create awareness about basic theoretical approaches and approximations to study the electrical and thermal conductivity of materials.
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1. Fundaments of crystal lattices, classification of crystal systems and construction of reciprocal lattices, identify the classical and quantum free electron theory and the related applications 2. Crystal Diffraction by X-ray, Brillion zone 3. Elastic Properties of Solid 4. Lattice Vibration and Concept of Phonons 5. The heat transmissions in crystals based on theoretical foundations of phonons and lattice vibrations, differentiate the theories of the same

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core II

Title of the Paper: Nuclear and Particle Physics

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	Course Objectives: To provide an exposure to general properties of nucleus, nuclear reactions. To understand the nucleus and its properties
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1. To Basic knowledge of nuclear size, shape, binding energy etc, the characteristics of nuclear force in detail. 2. Accelerators for charged Particles. 3. The nuclear properties and different nuclear models and nuclear structure 4. Nuclear decay processes and their outcomes. Have a wide understanding regarding βeta and gamma decay. 5. Elementary Particles . Symmetry Schemes of elementary particles

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core III

Title of the Paper: Digital Electronics

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To learn Combinational Logic Circuits and Sequential Logic Circuits
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following :
	1.Number System
	2.Number codes and basic of logic gates
	3.Flip-flop and registers
	4.Counters
	5.ADC and DAC

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core IV

Title of the Paper: Atomic and Molecular

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To provide a quantum mechanical understanding of atomic and molecular processes through spectroscopy and the applications to understand the structure of different types of matter. To enable the students to understand various applications of spectroscopic techniques.
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1.Nuclear Magnetic Resonance Spectroscopy 2.Electronic spectra of Diatomic molecules 3.Raman Spectra 4.Mossbauer Spectroscopy 5.Electron Spin Resonance spectroscopy

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core I

Title of the Paper: Condensed Matter Physics-II

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	Corse the objective of the paper is to aware the students about the field of Condensed matter physics
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following: 1. Superconductivity 2. Fundamentals of ferroelectric properties of materials 3. Imperfection in crystal 4. Thin film 5. Nano Structure

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core II

Title of the Paper: Laser Physics

Pre-requisite (if any)	B.Sc with Physics as one of the Subject
Course Objectives	To learn Basics of LASER
Course Learning Outcomes	After the completion of the course student will be able to understand the mechanism of the following :
	1.Basic properties of LASER
	2.Properties of Laser Beams and Resonators
	3.Different type of laser
	4.Application of laser
	5. Basic idea about non linear optics

CLASS - M.Sc. SEMESTER - IV

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

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PAPER – III (Optional

–II)

Title of the Paper: Computational Methods and Programming PAF

PAPER Code- PH43

Optional -II

Course Objectives To provide suitable and effective methods called Numerical Method After the completion of the course student will be able to understand the mechanism of the following:	Pre-requisite (if any)	
	Course Objectives To provide suitable and effective methods called <i>Numerical Method</i>	
Course Learning Outcomes 2. Method for determination of Zeros of algebraic equation 3. To find the Eigen value and Eigen vector of Matrices 4. Different method for Interpolation 5. Numerical solution of ordinary differential equation	_	mechanism of the following: 1. Basic of C programming 2. Method for determination of Zeros of algebraic equation 3. To find the Eigen value and Eigen vector of Matrices 4. Different method for Interpolation

CLASS - M.Sc. SEMESTER - IV

Marks 75+25 (CCE) =100

SUBJECT - PHYSICS

PAPER -Core IV (Applied Paper-

I)

Title of the Paper: Communication Electronics PAPER Code- PH44

Pre-requisite (if any)	
Course Objectives	To provide the basic technical knowledge of electronic communications and the various types of modulation methods.
	After the completion of the course student will be able to understand the
	mechanism of the following:
	1. Basic of Modulations
Course Learning Outcomes	2. Propagation of waves
Outcomes	3. Microwave transmission
	4. Basic of digital communication
	5. Data transmission

Seed Technology

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Class B.Sc 1 st year

Title of the Paper (Course) Basic of Seed Technology Course Code- 118-I Course objective: To understand about seed technology and seed on completion of the course the student is expected to be able to knowledge and understanding. CO1

- 1. Understand the seed technology, aim, role of seed technology.
- 2. Understand the seed and seed programme.

CO2

1. students can know about floral biology and embryology

CO3

1. Student get knowledge about the dicote and monocote seed structure and seed dormancy.

CO4

1. Student will understand about the seed germination and seed deteriotion.

CO5

1. Student can understand about method of plant tissue culture technique, synthetic seed preparation and terminated seed.

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Class B.Sc 1 st year

Title of the Paper (Course) Seed Production and Practices Course Code - 118 - II Course objective: To understand method of seed production of cereals, pulses, oil seeds, fodder crop, fibres crop, sugar and vegetable.

CO1

1. Student would understand the method of seed production of cereals.

co2

1. Student would understand the method of vegetable and oil seeds...

CO3

1. Student would understand the method of fibres and sugars.

CO4

1. Taxonomic study of families

CO5

1. Student will learn about the different weeds and method of weed control

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Class B.Sc 1 st year Practical

- 1. To understand about seed structure chemical composition.
- 2. To understand about different seed and weeds

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Class B.Sc IInd year

Title of the Paper (Course) - Plant breeding Course Code - 218 -I

Course objective: To understand about plant breeding for crop improvement.

CO1

1. Student can about plant breeding self-incompatibility and male sterility.

CO2

1. Students will understand about germplasm conservation seed bank plant introduction and selection. .

CO3

1. Student will learn about hybridization techniques and breeding methods

CO4

1. Student will learn about heterosis and mutation breeding

CO5

1. Student will learn about insect and disease resistance

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Class B.Sc IInd year

Title of the Paper (Course) Seed Testing and Quality Control Course Code – 218 - II Course objective: to understand about seed testing and seed certification.

CO1

- 1. Student will understand the seed testing procedure of seed testing and seed sampling . CO2
- 1. Student will learn about different seed quality test.

CO3

1. Student will understand about seed certification method and seed standard.

CO4

1. Student will learn about seed crop inspection.

COS

1. Student will understand about seed low and policies.

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Class B.Sc IInd st year Practicl

- 1. To understand about seed testing, seed certification.
- 2. To understand about hybridisation technique.
- 3. To understand about works of different sampling and testing equipment.

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Class B.Sc IIIrd year

Title of the Paper (Course) Seed Pathology and Entomology Course Code -318 - I Course objective: To understand about the seed pathology and entomology CO 1

1. Student will underastand about the seed pathology and seed borne disease.

CO 2

1. Student can underastand about storage fungy.

CO 3

1. Student will understand about mycotoxine

CO 4

1. Student will learn about . insect life cycle and insect control..

CO 5

1. Student can learn about insect control method and insecticide

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Class B.Sc IIIrd year

Title of the Paper (Course) Seed Processing, Storage and Marketing

Course Code - 318 - II

Course objective: To understand about seed processing storage and seed marketing. CO1

1. Student can learn about the seed processing seed conditioning and seed layout of seed processing plant.

CO2

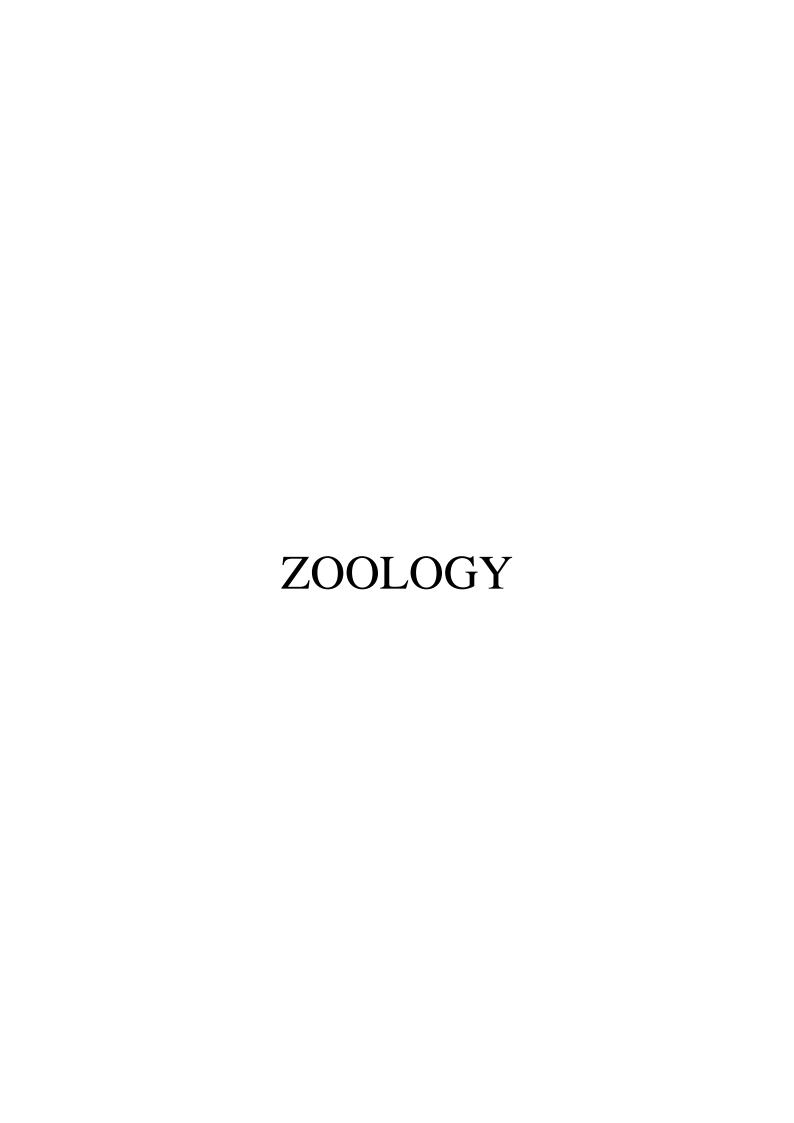
- 1. Student will understand about seed drying seed cleaning and seed blending
- 1. Student will learn about seed treatment method and know about seed treating chemicals CO4
- 1. Student will understand about seed bagging and seed storage CO5
- 1. Student will understand of component of seed marketing

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Class B.Sc IIIrd st year Practicl

- 1. To understand about beneficial seed borne disease and their control.
- 2. To understand about beneficial and harmful insects and their life cycle.
- 3. To understand about seed processing technique and processing equipment.



	Class: B.Sc. I YEAR - Paper I Core Course (Major) Animal Diversity: Non-Chordata		
	Paper Code - C 120 - I		
1	Course Learning	Upon Completion of the course students should be able to - 1 Learn about the importance of systemic, taxonomy and phylogeny to get a concrete idea of evolution of non-chordate phyla. 2 Understand the various morphological, anatomical structures and functions of animals of different phyla.	
	Outcomes	3 Get the knowledge about economic, ecological and medical significance of various animals in human welfare.	
		4 Understand the important parasites and their control measures.	

	Class: B.Sc. I YEAR - Paper II			
	Core Course			
	(Majo	r) Cell Biology, Reproductive biology and Development Biology		
	Paper Code - C120 - II			
		Upon Completion of the course students should be able to - 1 Develop deeper understanding of what life is and how it functions at cellular level 2 Understand the nature and basic concepts of cell biology, Reproductive		
1	Course Learning Outcomes	and Development biology 3 Understand structure and functions of cell membrane and cellular organelles		
		4 Understand the importance of latest reproductive trends, reproductive techniques to be applied for human welfare.		
		5 Understand the general patterns and sequential developmental stages during embryogenesis; and understand how the developmental processes		
		6 Understand about the evolutionary development of various animals.		

Paper -1 - Vertebrates and Evolution - Class: B.Sc. II YEAR			
	Paper Code - C220 - I		
1	Course Learning Outcomes	Upon completion of the course students should be able to gain Knowledge of — 1 Origin & Classification of Chordates 2 Comparative study of integuments, limbs and girdles, digestive and respiratory systems of Vertebrates 3 Comparative account of aortic arches, brain, Urinogenital system of Vertebrates and Sense organs, Placentation in mammals 4 Different theory of Origin of life. 5 Study of fossils, Evolution of man, Zoogeographical distribution, Geological time scale.	

	Paper - 2 - Animal Physiology and Biochemistry - Class :B.Sc. II YEAR		
	Paper Code - C220 - II		
1	Course Learning Outcomes	Upon completion of the course students should be able to gain Knowledge of — 1 Nutrition and Metabolism (Carbohydrate protein and fates) 2 Physiology of Respiration, Excretion and immune System 3 Regulatory Mechanism of Enzymes and role of Vitamins 4 Neuromuscular Co-ordination 5 Structure and function of different Endocrine glands	

Paper -1 - Genetics - Class: B.Sc. III YEAR		
Paper Code - C320 - I		
		Upon completion of the course students should be able to - 1 Heredity and Genetic Material
1	Course Learning Outcomes	2 Gene Expression, Genetic Code, Transcription and Translation in Prokaryotes. Types of Genes
		3 Linkage and Chromosomal aberration, Sex Determination & Matution
		4 Human - Genetics, Karyotype, Genome Project, Multiple Allele, Types of Syndromes, Genetics Diseases in Human.
		5 Genetic Engineering, Recombinant DNA Technology, PCR, Blotting, DNA Finger Printing, Gene Therapy

	Paper - 2 - Ecology and Applied Zoology - Class: B.Sc. III YEAR		
	Paper Code - C320 - II		
1	Course Learning Outcomes	Upon completion of the course students should be able to - 1 Concepts of Ecology – Component of Ecosystem, Energy flow, Biogeochemical Cycle, Population Concept, Concept of Community 2 Habitat ecology – Fresh water, Marine and Terrestrial Habitat, Ecological Division of India, Biodiversity 3 Wild life and Environment, Types of Pollution, Urbanisation 4 Aquaculture – Prawn Culture, Pearl Culture, Frog Culture, Major Carp Culture, Maintenance of Aquarium 5 Economic Entomology – Sericulture, Apiculture, Lac Culture, Common Pests, Biological Control of Insect pests.	

Class: M.Sc. I Sem. Marks: 75

+ (CCE) 25 = 100

Subject : Zoology Credit : 4

Paper: Core 1

Title of the paper - Biosystematics ,Taxonomy and Evolution Code of

the paper: ZO11

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of - 1 Classification of animals on the basis of their relation to other animals by body structure & external characters and Dimension of Speciation. -2 Application of the principles and techniques for Taxonomic procedures. Able to apply the International rules of Nomenclature to give a scientific name to animals
		 - 3 Calculation and understand different biological indices. - 4 Concepts and Theory of Organic Evolution. - 5 Macro & Micro evolution & Molecular Population Genetics.

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Class: M.Sc. I Sem. Marks: 75

+ (CCE) 25 = 100

Subject : Zoology Credit : 4

Paper: Core 2

Title of the paper - Structure and Function of Invertebrates Code of

the paper: ZO12

1	Course Learning outcomes	On completion of the course, the student is expected to be able to gain Knowledge and Understanding of - 1 Structure and organization of invertebrate animals.
		-2 Modifications in various functions of animals during transition from lower invertebrates to higher vertebrates
		- 3 Mechanism of Osmoregulation in Invertebrates.
		4 Primitive and Advanced nervous system in Invertebrates.5 Significance of larval forms of invertebrates.

Class: M.Sc. I Sem. Marks: 75

+ (CCE) 25 = 100

Subject : Zoology Credit : 4

Paper: Core 3

Title of the paper – Quantitative Biology, Biodiversity and Wildlife Code of

the paper: ZO13

1	Course Learning outcomes	1 Explain mean, Mode, Median, SD and
		Graph, Bar Diagram.
		2 Describe Sampling theory, Variance, Co-
		relation, T-test & Chi square test.
		3 Describe Biodiversity - Concept, Causes for
		the loss of biodiversity, Data of National
		Biodiversity.
		4 Explain Wild life – Values, protection act,
		Conservation, Causes for extinction,
		Endangered and threatened Indian species.
		5 Study of wild life – National Parks and
		Sanctuaries, different project, wild life of
		M.P. and wild life crossing.

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Class: M.Sc. I Sem. Marks: 75

+ (CCE) 25 = 100

Subject : Zoology Credit : 4

Paper: Core 4

Title of the paper - Biomolecules and Structural Biology Code of

the paper: ZO14

1	Course Learning outcomes	On completion of the course, the student is
		expected to be able to gain knowledge and
		understanding of - 1 Concepts of Chemical
		Properties (such as pH pk etc) of Acids and
		Base and Structure of Amino acids peptides
		-2 Structure and functional importance of
		DNA and RNA
		- 3 Carbohydrates and Fat metabolism
		- 4 Biosynthesis of biomolecules
		- 5 Mechanism of Enzymes and Principles of
		thermo dynamics.

Class: M.Sc. II Sem. Marks: 75 + (CCE) 25

= 100

Subject : Zoology Credit : 4

Paper: Core 5

Title of the paper - General and Comparative Animal Physiology and Endocrinology

Code of the paper: ZO21

1	1 Course Learning outcomes	1 Explain physiology of Respiration, nerves impulse transmission, transport of gases and
		2 Study of Patterns of physiology of digestion, excretion, Osmoregulation, Thermoregulation in different animal group and pregnancy.
		3 Comparative study of different Receptors including Lateral line systems in Fishes.
		4 Study of Bioluminescence, Pheromones, Chromatophores and Hormones.
		5 Study of Various Endocrine glands and Hormone and Reproduction.

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Class: M.Sc. II Sem. Marks: 75 + (CCE) 25 =

100

Subject : Zoology Credit : 4

Paper: Core 6

Title of the paper - POPULATION ECOLOGY AND ENVIRONMENTAL PHYSIOLOGY

Code of the paper : ZO22

1	Course Learning outcomes	On completion of the course, the student is expected to be able to gain Knowledge and
		Understanding of - 1 Populations, their
		characteristics and regulation of population
		-2 Correlating physiological adaptations to
		environment and pollution, control measures for
		-3 limiting factors, predator-prey relationships and
		physiological responses of the body to
		-4 Environmental Hazards as well as risk factors to
		human health.
		-5 Concept of homeostasis and methods of
		relaxation of Stress and body by Yoga, meditation
	1	1 Course Learning outcomes

Class : M.Sc. II Sem. Marks: 75 + (CCE) 25

= 100

Subject : Zoology Credit : 4

Paper: Core 7

Title of the paper - Tools and Technique's Code of the paper

: ZO23

1	Course Learning outcomes	On completion of the course, the student is expected
		would be able to get the Knowledge and Understand
		the basic principles, working and Applications of - 1
		Explain Microscopy, Colorimetry, Chromatography
		and of related instruments.
		-2 Demonstrate Microbiological, Cytological,
		Histological,
		Molocular higlogical tochniques
		-3 To understand of basic principles, application and
		types of Radioactivity, demonstrate Immunological
		Surgical Immunodetection techniques.
		-4 To Learn different mode of application of
		microtome and cell culture techniques.
		-5 To be familiarized to cytological and molecular
		biological techniques.

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Class : M.Sc. II Sem. Marks: 75 + (CCE) 25

= 100

Subject : Zoology Credit : 4

Paper: Core 8

Title of the paper - MOLECULAR CELL BIOLOGY AND GENETICS Code of the paper

: ZO24

Course Learning outcomes	On completion of the course, the student is expected to be able to gain knowledge and understanding of - 1 Transport across cell membrane, Cell movements and transportation of protein
	-2 Cell- Cell signaling
	-3 Cell- Cell adhesion and communication
	-4 The process of Sex determination and Human Genome
	-5 Human genetic disorders, Genetic Diseases Genetic screening and Genomics

Class: M.Sc. III Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Core 9

Title of the paper - Comparative Anatomy of Vertebrates

Code of the paper:

ZO31

1	Course Learning outcomes	On completion of the course, the student is expected
		to be able to Knowledge and Understanding of - 1
		Evolutionary origin and Comparative study of
		integument, Respiratory organ and Alimentary Canal
		in Vertebrates.
		-2 Comparative study of heart, blood and blood circulation, aortic
		arches and skeletal elements in vertebrates.
		-3 Comparative study of Urinogenital system, nervous system
		(brain, spinal cord and their nerves) in vertebrates.
		-4 Anatomical adaptations in vertebrates.
		-5 General organization of Agnathes and Gnathostomes.

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Class: M.Sc. III Sem. Marks: 75 + (CCE) 25 =

100

Subject : Zoology Credit : 4

Paper: Core 10

Title of the paper - Eco-toxicology Code of the paper : ZO32

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of - 1 Basic Knowledge of General
		Principles of factors of Eco-system.
		-2 Recycle and Re use techniques for solid & liquid waste, remote Sensing uses in biological System and Environment indicators.
		-3 Different type of environmental pollution
		-4 Basic Concept of Toxicology.
		-5 Effect of pesticides and heavy metals on environment and diseases caused by them.

Class: M.Sc. III Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Elective 1/1

Title of the paper - Limnology Code of the paper : ZO33A

1	Course Learning	On completion of the course, the student is expected to be able to
	outcomes	Knowledge and Understanding of – 1 Lottic and lentic ecosystem of
		fresh water with reference to fishery
		-2 Limnological parameter of water bodies
		-3 The significance of aquatic flora, fauna, insects, birds and
		macrophytes in water bodies
		-4 Pollution of rivers, causes and control measures.
		-5 Legislation and regulation on discharge of industrial effluents and
		domestic wastes in rivers and reservoirs.

Class: M.Sc. III Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Elective 1/2

Title of the paper - Immunology Code of the paper : ZO33B

1 Course Learning outcomes

On completion of the course, the student is expected to be able to Knowledge and Understanding of -1 The focus of this course is on the general principles of immunology, historical background, adaptive and innate immunity, hmoral and cell-mediated immunity.

- -2 To understand general aspects of immune system like different components of the immune system, generation and functions of these components, structure and functions of primary lymphoid organs Thymus; Bursa of Fabricus., structure and functions of secondary lymphoid organs spleen; lymph nodes and the lymphatic system, antigens and immunogenicity Essential features of antigens and factors that govern immune response: epitopoes, haptens, protein epitomes, immune response to hapens and carriers.
- -3 To introduces the students with fundamentals and applications of Immunoglobulins immunoglobulin classes and subclasses, general properties of immunoglobulins, the complement system Complement components; the classical complement pathway; the alternative complement pathway; regulation of the complement system: Biological effect of complement and the major histocompatibility complex.
- -4 The focus of this course is on the Hypersensitivity and immunization programme.
- -5 This course will introduce students to the principles of advanced Immunology, both at the molecular and cellular levels. Cells involved in the immune response: Lymphoid cells –T- cells, B-cells, NK cells, Dendritic Cells, Mononuclear phagocytic system, Antigen presenting cells, Polymorphonuclear granulocytes neutrophils, eosinophils, basophils and mast cells, platelets and various modern immunological techniques.

Class: M.Sc. III Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Elective 2/1

Title of the paper - Aquaculture

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Aquaculture Special reference to fisheries science.
		-2 Fish, Prawn, Mussel, Oyster and Frog Culture.
		-3 New techniques related to fish culture and transport of fish.
		-4 To prepare fish farm related information & fish preservation technique.
		-5 Fish related diseases and fish marketing.

Code of the paper: ZO34A

Department of Zoology

Class: M.Sc. III Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Elective 2/2

Title of the paper - Cellular Organization and Molecular Organization Code of the paper : ZO34B

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of -1 The new and novel applications to solve biomedical problems and basic understanding of yeast
		-2 The cytochemistry of some organelles, genetics, developmental biology
		-3 Application of DNA technology and molecular biology in targeting of biomolecule
		-4 The concept of normal cells and cancer cells and the genetic basis of cancer and the role of oncogenes and proto-oncogenes.
		-5 Eradication human cancer, tumor suppressor genes human papillomavirus and its vaccine and receptor – Ligand interaction.

Class: M.Sc. III Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Open Elective (Inter disciplinary)

Title of the paper - Basic of Bioinformatics Code of the paper :

OE-BB

1	1 Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Introduction to Bioinformatics and Biological database
		-2 Sequence Alignments
		-3 Structural Bioinformatics
		-4 Motif and Domain database and Phylogenic analysis
		-5 System Biology

Class: M.Sc. IV Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Core 11

Title of the paper - ANIMAL BEHAVIOUR AND NEUROPHYSIOLOGY Code of the paper : ZO41

1	Course Learning outcomes	On completion of the course, the student is expected to be able to knowledge and understanding of -1 Neurophysiology of perception memory, domestic animal and human behavior.
		-2 Neural And Hormonal Control Of Behavior motivation and communication
		-3 Biological rhythms, learning and memory.
		-4 Reproductive, parental and social behavior
		-5 Thermoregulation communication in birds

Department of Zoology

Class: M.Sc. IV Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Core 12

Title of the paper - Gamete Biology, Development and Differentiation Code of the paper : ZO42

1	Course Learning outcomes	On completion of the course, the student is expected to be able to
	outcomes	Knowledge and Understanding of -1 . Basic Concept and theories related to Gamete Biology, Gametogenesis & Biochemistry of
		-2 Embryo transfer technology in vitro oocyte maturation, ovarian follicular growth and differentiation.
		-3 Techniques of cryopreservation and Teratological effect.
		-4 Development of gonads and Embryology of Chick and frog.
		-5 Embryonic Stem cells, cell diversification in early Amphibian embryo. Totipotency and Pleuripotency.

Class: M.Sc. IV Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Elective 3/1

Title o the paper - Ichthyology (fish Structure and function)

Code of the paper: ZO43A

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Evolutionary origin, Classification and Structure of integument, Fins, girdles in fishes.
		-2 Functional anatomy of respiratory organs, Weberian ossicles and brain.
		-3 Structure and Function of Excretory, luminous, Acoustic and Electric Organs.
		-4 Special organ, Hill stream and Deep sea adaptations in fishes.
		-5 Development and parental care in Fishes.

Department of Zoology

Class : M.Sc. IV Sem. Marks: 75 + (CCE) 25 = 100

Subject : Zoology Credit : 4Paper: Elective 3/2

Tie of the paper - Biology of Parasites Code of the paper : ZO43B

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Selected protozoan Parasites like- Entamoeba, Trypanosoma, Leishmania and Plasmodium with structure, life cycle, pathogenicity, treatment and control.
		-2 Concept of parasitism and other animal associations mainly of parasitic Trematodes like- Fasciolopsis, Clonorchis, Heterophyes and Schistosoma structure, life cycle, pathogenicity, treatment and control.
		-3 Structure, life cycle, pathogenecity, treatment and control Cestode Parasitesviz-Diphyllobothrium, Taenia, Hymenolepis and Echinococcus.
		-4 Basic features and characteristics of hosts
		-5 Major means of transmission of parasites stool examination
		and its significance

Class : M.Sc. IV Sem. Marks: 75 + (CCE) 25 = 100

Subject : Zoology Credit : 4

Paper: Elective 4/1

Title of the paper - Pisci Culture and Economic Importance of Fishes Code of the paper : ZO44A

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Different methods of fish
		-2 Management of Ponds for fish culture.
		-3 Prawn, Pearl and Composite fish Culture. Fishery
		resources of M.P. and India.
		-4 offshore, coastal and Deepsea fisheries of India
		-5 Role of Fisheries in Rural development.

Class: M.Sc. IV Sem. Marks: 75 + (CCE)

25 = 100

Subject : Zoology Credit : 4

Paper: Elective 4/2

Title of the paper - Cell Biology

1 Course Learning outcomes

On completion of the course, the student is expected to be able to Knowledge and Understanding of -1 This unit introduces the students to the basic and advanced feature of eukaryotic chromosomes and its components details of mitotic chromosomes, various types of giant chromosome their structural organization and functional significance, DNA methylation and significance of heterochromatin. This gives them a strong foundation on the basic unit of life. At the end of the course, the student has a strong foundation on the functions of the cell.

Code of the paper: ZO44B

- -2 This unit deals with structural organization of various kinds of eukaryotic genes, and their evolution organization evolution and significance of gene families: organization, evolution and significance, jumping genes mutation mechanism and repair mechanism along with the concrete understanding about eukaryotic transcriptional machinery.
- -3 This unit imparts the knowledge of DNA transcription apparatus, zinc finger steroid receptors, domains, Helix-loop helix and Leucine Zipper, transcription and its control, stress response and genetic basis of few disease.
- -4 The main objective of this unit is to understand DNA rearrangement, mechanism of programmed cell, ageing and senescence and early development of *C. elegans*.
- -5 This unit develops a clear understanding on the various stages of development in *Drosophila* and significance of genes.

Class: M.Sc. IV Sem.	Marks: 75 + (CCE)	
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25 = 100

Subject : Zoology Credit : 4

Paper:

Title of the paper - Applied Zoology Code of the paper :

1	Course Learning outcomes	On completion of the course, the student is expected to be able to Knowledge and Understanding of – 1 Vectors and Communicable disease
		-2 Beneficial Insects
		-3 Aquaculture
		-4 Common Pests
		-5 Animal Farming And Culture



Govt. Holkar (Model, Autonomous) Science College, Indore Department of Geology

Class B.Sc. I Year

Title of the Paper (Course) Geodynamics and Geomorphology

Course Code 111-I

Course Objectives: This course enables the students to appreciate the dynamic nature of the Earth processes. They will also be appraised about the geodynamics of the lithosphere and concept of isostacy, ocean floor spreading, continental drift, plate tectonics. This course will also impart knowledge of various geomorphic processes operation on the earth and their effects on the land surface.

Course Outcomes:

CO1: Student will gain preliminary knowledge of Geology, its Branches and importance. They will understand Solar System and Earth as dynamic body and also able to understand about origin, age and interior of the Earth

CO2: Student will gain basics knowledge about the Earthquakes, Volcanoes, Isostasy. Continental drift and about Sea-floor Spreading

CO3: Student will able to understand the Concept of Plate tectonics, Mid-oceanic ridges and trenches, Island arcs. Also will able to know about basic principles Geomorphology and rock weathering.

CO4: Students will gain knowledge about Geological work of Rivers and wind and their landforms. Also learn about volcanic landforms.

CO5: Students will gain knowledge about Geological work and landforms of Glaciers, Underground water and Ocean. Also understand about Karst topography and Coral Reefs.

Govt. Holkar (Model, Autonomous) Science College, Indore Department of Geology

Class B.Sc. I Year

Title of the Paper (Course) Crystallography and Mineralogy

Course Code 111-II

Course Objectives: Studying the basics of mineralogy and crystallography helps in understanding and building the overall knowledge in Geology.

Course Outcomes:

CO1:Crystallography and Mineralogy are the Fundamental branches of Geology hence, by the learning about basics of Crystals and Minerals, students can understand these branches in a batter way.

CO2:Student will able to understand the certain laws of Crystals because Crystals obey certain laws of nature. Also gain knowledge of symmetry elements of crystal and type of twinning present in crystals.

CO3:Be able to know about the physical properties of minerals which make capable to identify rock forming minerals in laboratory as well as in field.

CO4:Students will gain knowledge about polarizing microscope and able to identify minerals under microscope. Be able to gain the knowledge of optical properties of rock forming minerals.

CO5:Be able to gain knowledge about the Physical-Chemical-Optical and other characteristics of minerals. Also able to understand Mineral composition, Silicate structure, Classification and Mineralogical properties of various Mineral Groups.

Department of Geology

Class B.Sc. II Year

Title of the Paper (Course) Petrology

Course Code 211-I

Course Objectives: To give a systematic knowledge and understanding of the processes involved in the formation of igneous, sedimentary and metamorphic rocks, their textures, structures, classifications and their importance.

Course Outcomes:

CO1: The student will gain knowledge about the processes of formation of rocks.

CO2: The student will gain knowledge of the forms, structures and textures of the rocks.

CO3: The student will gain knowledge about the classification of rocks.

CO4: The student will be able to identify common Igneous, Sedimentary and Metamorphic rocks using hand specimens and also under microscope.

CO5: The student will also learn about the different types of map symbols used to show different rock types on map.

Department of Geology

Class B.Sc. II Year

Title of the Paper (Course) Structural Geology

Course Code 211-II

Course Objectives: The course deals with geological structures resulting from the action of various types of tectonic forces operating on rocks. The student will gain knowledge of the geometry of the rock structures, understand the mechanism of the evolution of rock structures and its application in the field.

Course Outcomes:

CO1: The course deals with the study of geological structures resulting from the various kinds of forces applied on the rocks.

CO2: The student will gain knowledge of the geometry of the rock structures and will be able to identify structures and do various measurements with Clinometer Compass.

CO3: The student will gain knowledge of the geometry of the rock structures, understand the mechanism of the evolution of rock structures and its application in the field.

CO4: Identification of measurements of structures is fundamental to geological mapping. This course also helps to learn how to interpret geological maps.

CO5: This course also helps to know how to use structures and help students appreciate the dynamic nature of the Earth.

Class B.Sc. III Year

Title of the Paper (Course) Palaeontology and Stratigraphy

Course Code 311-I

Course Objectives: To impart knowledge of the concepts in stratigraphy, correlation, and paleontology would enable the students to understand the changes that occurred in the history of the earth and relate them to their field observations and also, in understanding the framework of the stratigraphy of India

Course Outcomes:

CO1: The student will gain knowledge about fossils and fossilisation and able to identify morphology of various groups of invertibrate fossils and plant fossils.

CO2: Students will gain knowledge about the importance of fossils in establishing age of rock units, stratigraphic correlation and its application in hydrcarbon exploration.

CO3: Ability to understand diverse geology of India with standard geological time scale and enable to understand the framework of the stratigraphy of India

CO4: Be able to decipher the geological history of an area from a geological map. Understand the age and significance of depositional sequences.

CO5: Students will gain knowledge about economic mineral deposits and fossil content associated with various stratigraphic units of India.

Govt. Holkar (Model, Autonomous) Science College, Indore Department of Geology

Class B.Sc. III Year

Title of the Paper (Course) Earth resources and Applied Geology

Course Code 311-II

Course Objectives: To give knowledge of occurrence and distribution of economic minerals. This will also make students to learn about the basics of geology for mineral exploration, mining and engineering projects.

Course Outcomes:

CO1: The student will gain knowledge about earth resources and primary and secondary processes of mineral formation

CO2: Gain knowledge about origin, mode of occurrence, grade and specification of ores and industrial minerals of India. Be able to understand Geology and associated mineral wealth of our country and state.

CO3: Ability to understand geology and othervarious aspects of fossil fuels and atomic mineral deposits of the India. Also gain knowledge about mineral economics

CO4: Gain knowledge of the applied aspects of Geology in the field of prospecting, exploration and exploitation of minerals and learns about mineral beneficiation.

CO5: Student will gain preliminary knowledge about groundwater geology. Be able to understand importance of geological investigations in civil engineering projects and application of GIS and remote sensing in geological studies.

Department of Geology

Class M.Sc. I Semester

Title of the Paper(Course): Geodynamics Course Code- G-11

Course Objective: This course enables the students to appreciate the dynamic nature of the Earth processes. They will also be appraised about the geodynamics of the lithosphere and concept of isostacy, ocean floor spreading, continental drift, plate tectonics.

- 1. The student will gain knowledge about the origin and age of the earth. The student will also gain knowledge about the dynamic nature of the earth.
- 2. The student will gain knowledge of the interior of the earth and the natural phenomenon of volcanism and earthquakes.
- 3. The student will also gain knowledge about the geodynamics of the lithosphere and concept of isostacy, ocean floor spreading, continental drift and plate tectonics.
- 4. The student will also gain knowledge about the present and past magnetic properties of the earth
- 5. The student will also learn the implications of the modern concept of plate tectonics on various phenomenon such as volcanism, earthquakes and formation oftopographic features of global scale.

Department of Geology

Class M.Sc. I Semester

Title of the Paper(Course) Structural Geology Course Code- G-12

Course Objective:The course deals with geological structures resulting from the action of various types of tectonic forces operating on rocks. The student will gain knowledge of the geometry of the rock structures, understand the mechanism of the evolution of rock structures and its application in the field.

- 1. The course deals with the study of geological structures resulting from the diastrophic movement and various farces acted on the rocks.
- 2. The student will gain knowledge of the geometric and genetic classification of various structures with the help of Brunton and Clinometer compass.
- 3. The student will gain knowledge of the geometry of the rock structures, understand the mechanism of the evolution of rock structures and its applications in the field.
- 4. Identification of measurement of structures is fundamental to geological mapping. This course also help to develop understanding of geological maps and their interpretation, various laboratory and filed techniques of interpretation of the map.
- 5. The course also helps to know how to use structures and help students appreciate the dynamic nature of the earth.

Department of Geology

Class M.Sc. I Semester

Title of the Paper(Course) Indian Stratigraphy Course Code- G-13

Course Objective:To impart knowledge of the concepts in stratigraphy, correlation, and paleontology would enable the students to understand the changes that occurred in the history of the earth and relate them to their field observations and also, in understanding the framework of the stratigraphy of India

- The student will gain knowledge about the geology of India with emphasis on the Stratigraphy
 of Peninsualar and extrapeninsular India. Also gain knowledge about tectonic features of
 Indian subcontinent.
- 2. Be able to understand that how the rocks have been classified in geological sequences in lithostratigraphic units in terms of chronostratigraphic divisions.
- 3. Gain knowledge of Precambrian Geology, tectonics and associated economic mineral resources of Archeans of south, central, eastern and northwestern part of India and also about the geology of Proterozoic basins and associated mineral resources
- 4. Able to know about what are major boundaries in geological time scale and discuss the events related to the boundaries.Be able to understand the Indian stratigraphy of Paleozoic era including stratigraphy and fossils of the lower Palaeozoics of extra peninsular India and paleoclimate, plant fossils and coal deposits of Gondwana supergroup.
- 5. The student learnsabout Indian stratigraphy of Mesozoic era includes cretaceous and Jurassic rocks of India, associated fossils and mineral resources. Be able to understand the stratigraphy of Cenozoic era including Deccan volcanics, Siwaliks and associated fossils, tertiary rocks and associated hydrocarbons of northeast India.

Department of Geology

Class M.Sc. I Semester

Title of the Paper(Course) Mineralogy and Geochemistry Course Code-G-14

Course Objective:Studying the basics of mineralogy and crystallography helps in understanding and building the overall knowledge in Geology

- 1. Students will gain knowledge about the physical properties of Metallic and Non-metallic minerals which help in mineral search in field. Students will understand the various Classification Schemes related to Mineralogists and Economic geologists.
- 2. With the help of Classification and Mineralogical properties of various Mineral Groups. Students will able to learn theoretical and practical aspects of these Rock-forming mineral groups including Gemstones.
- 3. With the help of various Principles of Optics, students can learn the Optical Classification of Rock-forming minerals. Knowledge of optical properties of minerals, make enable students to identify mineral under polarizing microscope.
- 4. Students will gain knowledge of some more important Optical properties of minerals which ultimately set the students mind towards research in future.
- 5. Geochemistry play vital role in understanding the Geochemical processes of our planet. Study of Meteorites and other terrestrial materials help in understanding the Cosmic nature of our Solar System and Universe. Study of radioactive isotopes help in understanding the age determination of rocks.

Department of Geology

Class M.Sc. II Semester

Title of the Paper (Course) Geomorphology Course Code – G-21

Course Objective:The objective of this course is to impart complete knowledge of various geomorphic processes. Objective is to give knowledge about the mechanism of operation of various geomorphic agents, along with the relationship of landforms with climate and other geological parameters. Imparting the knowledge of classification and distribution of landforms is also one of the important objectives of this course.

- 1. Student will learn the historical perspective and development of geomorphology, i.e. the study of landforms.
- 2. Student will the learn about the various geomorphic processes that shape the landforms present around us.,
- 3. Students will learn to identify the landforms and will be able to understand the origin and evolution of landforms and will be able to understand the role of structure, stage and time in shaping the landforms
- 4. Student will be well versed with the different types of landforms of India.
- 5. Student will learn to perform drainage basin analysis. Student will also learn the relevance of applied aspects of Geomorphology to various other fields.

Department of Geology

Class M.Sc. II Semester

Title of the Paper (Course): Igneous and Metamorphic Petrology

Course Code - G-22

Course Objective: The course deals with Petrological aspects.. The student will gain knowledge of the various rocks, understand the classification according to their various factors and its application in the field

- 1. The course deals with various aspects like origin of magma and composition structures, textures and forms of rocks.
- 2. The student will gain knowledge of various rocks (igneous, sedimentary and metamorphic). Will be able to study rocks under microscope as well as in hand specimens.
- 3. The student will gain knowledge of the farms, texture, structures and interpretation of crystallisation. Its important in the field studies.
- 4. Students will get field knowledge of igneous, sedimentary and metamorphic rocks. Petrological studies also deles with petrochemical calculations and crystalisationhistary.
- 5. Thes courses helps to know the various rocks, types mode of occurrences and petrogenatic significance.

Department of Geology

Class M.Sc. II Semester

Title of the Paper (Course) Sedimentology

CourseCode - G-23

Course Objective:The course deals with various sedimentary structures resulting from the action of various types of agents operating on rocks. The student will gain knowledge of the geometry of the rock structures and Classification, understand the mechanism of the evolution of rock structures and its application in the field

- 1. Students will gain knowledge about the Processes of Sedimentation. They will understand about origin of Sediments and Lithification and Diagenesis. Gain knowledge about classification and nomenclature of the common sediments and Classification of Sedimentary rocks
- Student will understand about Origin, classification and significance of primary, secondary and
 organic sedimentary structures and understand Classification of Sandstone Limestone and
 Dolomite. Be able to understand Significance of Sedimentary Structures in Palaeocurrent
 studies.
- 3. Student will understand and gain knowledge aboutTextures of sedimentary rocks and their genetic significance. Granulometric analyses of clastic particles, data and interpretation of nature of sediments.
- 4. Student will understand and gain knowledge about elements and types of depositional environments: Continental Transitional and Marine environments.
- 5. Student will gain knowledge regarding Provenance and mineral stability, Concept and types of Sedimentary provenance. Separation and significance of heavy minerals. They will understand Tectonic framework of sedimentation (Kay's classification of tectonic elements) and Cyclothem, Graphical representation of Sedimentary rocks and their Interpretation. Heavy mineral analysis of sediments and its interpretation

Department of Geology

Class M.Sc. II Semester

Title of the Paper (Course) Paleobiology Course Code – G-24

Course Objective:

The objective of this course is to givecomplete knowledgeabout themode of fossilisation and morphological characteristics of animal and plant fossils, so student can learn and identify the fossils in thelaboratory as well as in the field. Objective is to impart knowledge about the evolutionary trends, geological distribution and uses and application of fossils.

- 1. The student will gain knowledge about the different aspects of fossils and fossilisation. Palaeobiology would enable the students to understand the appearance and evolution of life through the geologic time.
- 2. The student will gain knowledge about significance of fossil in establishing relative geological ages of rock units, stratigraphic correlations and classification as well as in palaeogeography and other geological studies.
- 3. Be able to learn and understand the morphological features, evolutionary trends and geological history and distribution of invertebrate, vertebrate, plant, and microfossils.
- 4. Study of invertebrate, vertebrate, plant, and microfossils enable students to identify and classify the fossils embedded in rock outcrops in the field.
- 5. The students will able to understand the Concept of micropalaeontology, and applications of microfossils in Fossil-fuel Exploration. Be able to learns Palaeobotany and Palynology and characteristic features of Gondwana flora.

Department of Geology

Class M.Sc. III Semester

Title of the Paper (Course) Economic Geology Course Code – G-31

Course Objective:

The objective of this course is to give complete knowledge about economically useful metallic and nonmetallic industrial minerals, rocks, mineral fuels and fossil fuels. Objective is to impart knowledge about the primary and secondary processes, mode of occurrence, uses, specifications of industrial minerals, geological and geographical distribution of minerals in the country.

- 1. The student will gain knowledge of different aspects of mineralising fluid and physical and chemical principles of mineral and ore deposition.primary processes of mineral deposits foramation
- 2. In-depth explanation is given to understand primary processes of formation of mineral deposit. Form size, texture, structure and mineral assemblages of the genetic groups of minerals
- 3. Be able to gain knowledge about ore minerals, Origin, mode of occurrence, association, economic uses, geological distribution and Indian occurrences of the minerals of important ores.
- 4. Be able to understand mineralogy, origin, mode of occurrences, association, geological distribution and Indian occurrences, and economic uses of important nonmetallic and industrial minerals of India.
- 5. The students will gain knowledge about all aspects of fossil fuels: liquid and gaseous hydrocarbons and coal, Geology of productive coal and oil fields of India. Be able to know about geological aspects of atomic minerals and their deposits in India and Nuclear power stations of the country and future prospects.

Govt. Holkar (Model, Autonomous) Science College, Indore Department of Geology

Class M.Sc. III Semester

Title of the Paper (Course): Mineral Exploration Course Code – G-32

Course Objective:

The objective of this course is to give complete knowledge about sequence of mineral exploration and various techniques used in mineral exploration. Objective is to impart knowledge about reconnaissance, geological mapping, geophysical and geochemical methods of mineral exploration and drilling investigation carried out during exploration..

- 1. Student can learn proper mineral sampling method. With the knowledge of Assay value calculation, Mineral reserve computation and Classification, student learn qualitative measurement, quantity determination etc. about the mineralization.
- 2. Student will able to understand the sequences of Mineral Exploration program. Student can learn about the Reconnaissance and Detailed geological mapping, Students also learn how such mineralization can be prospected.
- 3. With the knowledge of geochemistry student will able to understand the various methods of Geochemical exploration.
- 4. Various Geophysical practices have proved indispensable for hidden mineral deposits and in the areas of scanty exposures. Student will gain knowledge about the latest Geophysical mineral exploration techniques.
- 5. After the study and interpretation of different Exploration techniques, finally Drilling investigations are carried out to delineate the sub-surface mineral body. Student will gain knowledge and able to understand the various drilling methods.

Department of Geology

Class M.Sc. III Semester

Title of the Paper (Course) Photogeology and Remote Sensing CourseCode - G-33A

Course Objective:

The objective of this course is to give complete knowledge about the techniques of remote sensing as well as aerial photo and satellite image interpretation. Objective is to impart knowledge about remote sensing platforms and sensors, geological and geomorphological interpretation and application of photogeology and remote sensing techniques in mineral and groundwater exploration.

- 1. The student will gain knowledge of the fundamental principles and techniques of Remote Sensing.
- 2. Student will learn about the different types of Remote Sensing platforms and sensors.
- 3. Student will learn to interpret geology, geomorphology and geological structures from the aerial photographs and satelite images.
- 4. Student will also learn how to use the Remotely Sensed data for Mineral exploration and Groundwater exploration.
- 5. Student will also learn how to use the Remotely Sensed data for preparing Landuse and Landcover maps.

Department of Geology Govt. Holkar [Model, Autonomous] Science College, INDORE, M.P. Class M.Sc. III Semester

Title of the Paper (Course) Computer Applications in Geology (Elective - 1)

Course Code – G-33B

Course Objective:

The objective of this course is to give knowledge about the basics of computer operating system, hardware and types computer software. Objective is to impart general knowledge about computer programming languages, database management system and applications of computers in geological studies.

- 1. Student will learn about eh fundamental concepts about computer and operating system.
- 2. Student will learn about the hardware and peripheral devices and also about the types of computer software.
- 3. Student will gain a general idea about programming languages, interpreters and compiler. He will also learn about MS-DOS and Windows operating system.
- 4. Student will learn the basics of computer programming using Visual Basic and C++ and Visual basic
- 5. Student will learn about the popular database management systems like Oracle and will also learn about the applications of computers in geological studies.

Department of Geology

Class M.Sc. III Semester

Title of the Paper (Course) Hydrogeology Course Code – G-34A

Course Objective:

The objective of this course is to give complete knowledge about groundwater geology Objective is to impart knowledge about hydrological properties of rocks, occurrence and distribution of ground water, aquifer and its types, quality of ground water, artificial recharge methods of groundwater and about saline water intrusion.

- 1. The student will learn knowledge about the hydrogeology and their various parameters and also know how water gets into ground (recharge), how its flow in the subsurface and how ground water interacts with the surrounding soil and rocks.
- 2. Student will understand the different Hydrological properties of rocks. They understand and finding solutions of water problems in the Earth surface. Student know about aquifers and their types.
- 3. Gain knowledge about the quality and quantity of surface water, ground water and their availability in various purposes. Student learns about different artificial recharge methods of groundwater.
- 4. Student able to learn various water quality criteria for drinking purpose and irrigation purpose and also know how to plot chemical data on Graph and their importance.
- 5. Gain knowledge about a problem of saline water intrusion in coastal area and they know about how to control the sea water intrusion and their management.

Govt. Holkar [Model, Autonomous] Science College, INDORE, M.P. Department of Geology

Class M.Sc. III Semester

Title of the Paper (Course): Engineering Geology and Geotechniques (Elective - 2)
Course Code – G-34B

Course Objective

The objective of this course is to give complete knowledge about Engineering geology, geotechnical investigations and interpretations forsite selection of civil engineering projects. Objective is to impart knowledge about engineering properties of soil and rocks, seismic zoning and design of engineering projects, as well as field and laboratory techniques of geological investigations.

Course outcome

- 1. Student will understand the importance of geological studies in civil engineering projects.
- 2. Student will learn the importance of the engineering properties of soils and rocks.
- 3. Student will also learn how to do the geological investigations for site selection of civil engineering projects.
- 4. Student will also learn the importance of seismic zoning and its relation to design of buildings and other engineering projects.
- 5. Student will learn about the various field and laboratory techniques used for investigations in engineering projects.

Govt. Holkar [Model, Autonomous] Science College, INDORE, M.P Department of Geology

Class M.Sc. III Semester

Title of the Paper (Course): Remote Sensing (Open Elective Paper)

Course code: G35

Objective: The objective of this course is to give complete knowledge about the fundamentals of remote sensing. Objective is to impart knowledge about remote sensing platforms and sensors and fundamentals of image interpretation and applications of remote sensing. One of the objective is also to make the students aware of Geographic information system.

- 1. The student will gain knowledge of the fundamental principles and techniques of Remote Sensing.
- 2. Student will learn about the fundamental techniques of Aerial photography.
- 3. Students will learn about Remote Sensing Platforms and sensors.
- 4. Student will learn about image interpretation techniques.
- 5. Student will also learn about types of maps, applications of Remote Sensing and fundamentals of GIS.

Department of Geology

Class M.Sc. IV Semester

Title of the Paper (Course) Ore Geology Course Code – G-41

Course Objective:

The objective of this course is to give complete knowledge about various aspects of ore geology. Objective is to impart knowledge about the geological processes of ore formation, ore microscopy, mode of occurrence, uses, specifications of industrial minerals, concept of mineral economics, National mineral policy and war related strategic, essential, critical minerals.

- 1. The student will gain knowledge about the different aspects of ore genesis, geothermoberometry, paragensis and zoning and learns about metallogeneic provinces and epochs with special reference to India.
- 2. Student will able to understand secondary processes of formation of mineral deposits with relevant examples of Indian mineral deposits.
- 3. Study of ore microscopy enable students to understand the concept of ore microscopy, ore textures and optical properties of ore minerals under reflected light. Gain knowledge about significance of ore microscopy in ore genesis and ore beneficiation.
- 4. Be able to understand origin, mode of occurrences, association, specification, grades of nonmetallic minerals used in various industries namely cement, fertilizer, abrasive, paint pigments, glass and refractory industry.
- 5. Study of mineral economics, national mineral policy and mineral concession rules enable students to understand that how minerals play vital role in economy of country. Student will learn about significance of minerals for a nation in defense and war in terms of strategic, critical and essential minerals.

Department of Geology

Class M.Sc. IV Semester

Title of the Paper (Course): Applied Geology Course Code – G-42

Course Objective:

The objective of this course is to impart complete knowledge about applied aspects of Geology. Objective is to give knowledge about the application of Geological know how in the mineral exploration, in the mining operations, in the site selection of civil engineering projects, in groundwater geology, in environmental geology and study of remote sensing and GIS.

- Students will gain knowledge about the Prospecting, Exploration, Quality and Quantity evaluation of mineral deposits, Exploitation and various open cast and underground mining methods.
- Students can learn various Coal mining methods, Underground Geological Mapping,.
 Students will gain idea about the different methods of mineral Dressing and stages of mineral Concentration.
- 3. Students get know about engineering properties of Rocks and Soil etc. Students also learn whether the proposed site for Engineering is Topographically, Lithologically, Structurally, Environmentally is suitable and socially viable or not.
- 4. Students will able to gain knowledge of Groundwater Geology, Hydrological properties of rocks and Groundwater Exploration techniques. Will also knowabout Groundwater Provinces and Zones of India. Students will also gain knowledge about Environmental Geology.
- 5. Remote Sensing and GIS are the advanced tools used in most of the sectors including Geology. Students will gain Basic knowledge, advantages and limitations of Remote Sensing. GIS is integral part of remotesensing hence students can learn general idea about GIS and popular GIS software's.

Department of Geology

Class M.Sc. IV Semester

Title of the Paper (Course) Environmental Geology(Elective -3)

Course Code - G-43A

Course Objective:

The objective of this course is to impart complete knowledge about the various aspects of Environmental geology. Objective is to give knowledge about the natural andmanmade environmental issues and problems related to Geology and application of remote sensing and GIS in environmental Geology and also give knowledge about watershed management.

- 1. Student learns about various concepts of Environmental Geology and their scope and importance. Also gain knowledge about Global warming and environmental problems in India.
- 2. Student able to understand environmental impact of large dam, River water disputes, mining, soil and land degradation etc. on environment.
- 3. Student learns about Air, water and soil pollution and their environmental effects. They also understand natural hazards Earth quakes, volcanoes, floods, cyclones and Drought and their impact on environment.
- 4. Student learns how to manage and control various natural and man made induced hazards. They also understand the management of solid waste, waste water etc.
- 5. Student learns about application of Remote Sensing and Geographical Information System (GIS) in environmental geology. Student gain knowledge about watershed management, waste land reclamation, land use pattern, Rain water Harvesting Techniques and different acts related to environmental protection and water pollution.

Department of Geology

Govt. Holkar [Model, Autonomous] Science College, INDORE, M.P. Department of Geology

Class M.Sc. IV Semester

Title of the Paper (Course): Mineral Processing and Technology [Elective - 3]

Course Code - G-43B

Course Objective:

The objective of this course is to impart complete knowledge about mineral processing and beneficiation techniques. Objective is to give knowledge about the different mineral processing and mineral dressing methods, Crushing, separation, froth flotation methods and important beneficiation flow sheets of Indian mineral deposits.

- The student will gain knowledge about the different aspects of mineral processing and mineral technology and able to understand the significant physical and chemical characteristics of ore minerals and Industrial minerals which are significant in mineral processing.
- 2. The student will gain significant knowledge about terminology in mineral processing and mineral dressing processes like Liberation, Comminution, Crushing, Grinding, Sizing.
- 3. Be able to learn and understand the various mineral separation Processes like Gravity concentration methods, tabling, jigging, heavy media separation, sedimentation, dewatering techniques,
- 4. The student will gain knowledge and understand about Forth Flotation, Magnetic separation and Electrostatic separation methods.
- 5. Be able to know and understand the Beneficiation flow sheets of Indian deposits like Coal, Copper, Lead-Zinc, Iron and Rock Phosphate.

Department of Geology

Class M.Sc. IV Semester

Title of the Paper (Course) Fuel Geology (Electivr-4) Course Code - G-44A

Course Objective:

The objective of this course is to give knowledge about mineral fuels and fossil fuels. Objective is to giveknowledge about various geological aspects of the coal, hydrocarbon and radioactive atomic mineral deposits, geology of existing fossil fuel and atomic mineral deposits of India and mining methods used in coal exploitation.

- 1. By the study of Coal, student will learn about the Physical and Chemical properties of Coal, Also able to understand Coal Petrography and different theories related to Origin of Coal.
- 2. Students will learn about the Indian and International classification of coal, Preparation practices for Washing, Carbonization, Gasification, Hydrogenation, and Briquetting of Coal.
- 3. Study of surface and/or underground coal mining methods, students can also learn about mining procedure. Students will alsogain knowledge of coal prospecting and about the Coal Bed Methane.
- 4. Students will learn about the Origin, Migration and Accumulation of Liquid and Gaseous hydrocarbons. Students also learn about the Petroleum Geology of important Oil and Gas fields of India.
- 5. Students can learn about the Geology of Radioactive minerals and associated rock types. Methods of Exploration for new atomic mineral deposits. Geology of existing atomic mineral deposits. Students will gain knowledge about nuclear power stations of India.

Govt. Holkar [Model, Autonomous] Science College, INDORE,

Department of Geology

Class M.Sc. IV Semester

Course Title : Project In House [Elective - 4] Course Code : G44B

Course Objective:

The objective of this course is to give geological field knowledge which includes geological mapping, sampling, geomorphological studies, mineralogical and geochemical analysis, petrographic studies. Objective is to learn research methodology and develop dissertation writing skill

Course Outcome:

Skills to be learned: The student will gain knowledge and able to learn various geological aspects during field project and also understand basic knowledge of geological mapping and laboratory work.



Gov	Govt. Holkar (Model Autonomous) Science College, Indore	
	Department of ECONOMICS	
	•••	
	Class- B. Sc. I Year	
	Title of the Paper (Paper-I):Micro Economics	
	Course Code: 121-I	
Course Objectives: This course is designed to expose the students to the basic principles of micro – economics theory and understand how market works. The emphasis will be on thinking like an economist the course will illustrate how micro economics concepts can be applied to household to analyze real life situations.		
Course Outcome :- After the successful completion of the course students should be able to-		
After the successful completion of this course, students should be able to		
CO-1	Explain the concept of nature of scope of economics, Inductive & Deductive analysis and will be able to explain core economic terms.	
CO-2	Get introduced to from work for learning about consumers behavior and laws of demands& Supply That determine equilibrium in a market economy.	
CO-3	Explain about firms and their decisions about optimal production.	
CO-4	Explain type of market structure and understand different between firm and industry demand curve.	
CO-5	Explain different theories to decide the rate of wages. Interest & rent in different conditions.	

Title of the Paper (Paper-II): Indian Economy

Course Code: 121-II

Course Objectives: This course will help in compressive understanding of Indian economy. To give death knowledge of booking & finance to students. A little understanding of India's foreign trade & various governmental policies & Programs will also be included to make student aware.

Course Outcome: After the successful completion of this course, students should be able to:

able to.	
CO-1	Develop ideas of the basic features of India economy & its Potential on natural resources.
CO-2	Understand agriculture as the foundation of economic growth and development, analysis the Process & Changing nature of agricultural sector and its contribution to whole economy.
CO-3	Explain industrial Policy before & after independence & Concept of SSI and Cottage industries in India with Various flagship Programs.
CO-4	Demonstrate India's Infrastructural growth and understand the structure of India's foreign Trade.
CO-5	Grasp the importance of planning undertaken by the government of India , have knowledge of various objectives, failures & Achievement's & Introduction of NITI Ayog.

Gov	Govt. Holkar (Model Autonomous) Science College, Indore	
	Department of ECONOMICS	
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	Class- B. Sc. II Year	
	Title of the Paper (Paper-I):Macro Economics	
	Course Code: 221-I	
Course Objectives: This course is designed to discuss the preliminary concepts associated with the determination & measurement of aggregate macroeconomics variables like savings, investments, GDP, inflation, money and balance of payment. This course will Provided an overall idea about national economic policies & its implication.		
Course Outcome :- After the successful completion of the course students should be able to-		
After the successful completion of this course, students should be able to		
CO-1	Explain the Process of calculating national income, identify its components, Demonstrate circular flow of income identities with government.	
CO-2	Understand says law of market classical & modern theory of employment demonstrate the principle of effective demand and Relationship between APC/MPC.	
CO-3	Explain the relationship between Investment & Savings, demonstrate investment multiples and understand the meaning of MEC & MEI	
CO-4	Explain the meaning and function of money , high powered money , Monetary & paper system , illustrate various versions of Quantity theory of money.	
CO-5	Identify types of banks, explain meaning & Functions of commercial bank and central bank and understand how bank create credit.	

$\label{thm:constraint} \textbf{Title of the Paper (Paper-II):} \textbf{Public Finance \& International Economics}$

Course Code: 221-II

Course Objectives: The main objective of this subject is to understand and analyze the impact of public policy of the allocation of resources and distributions of income in the economy & also analysis of public expenditures, Taxation, budgetary procedures and debt issues.

Course Outcome: After the successful completion of this course , students should be able to :

CO-1	Understand the source of finance both public & private, concept of GST (Goods and services tax).
CO-2	Delivers efficiently the preparation of budget & how they are passed in the house. Understand the changes in size & flexibility of state & central budget along with role played by finance commission.
CO-3	Identify basic difference between inter – regional & international trade explain various international trade theories to acquire goods at chcoper cost
CO-4	Explain terms of trade with different nations, different types of tariff imposed an international trade, land various international organizations with the function & currency.
CO-5	Explain composition & direction of foreign trade after international trade and concept of appreciation and depreciation of currency.

Govt. Holkar (Model Autonomous) Science College, Indore Department of **ECONOMICS** Class- B. Sc. III Year Title of the Paper (Paper-I):Development & environment Economics Course Code: 321-I Course Objectives: To explain development economic Growth theories, international trade development theories and learn hardcore economic prescription to development. Demonstrate understanding of difference between growth & development, the measurement of inequality and concept of developed economics. Course Outcome: On completion of the course students would be able to After the successful completion of this course, students should be able to **CO-1** Explain economic growth and development, illustrate factors of economic development. **CO-2** Illustrate and apply various classical theories of economic growth. **CO-3** Explain the concept of balanced and imbalanced growth, illustrate harod - Domar and solow's growth model. **CO-4** Explain importance of gender equality and women empowerment and techniques of production.

Realize the importance and influence of environment on the economy,

suggest appropriate measures to correct environment degration.

CO-5

Title of the Paper (Paper-II):Quantitative Techniques

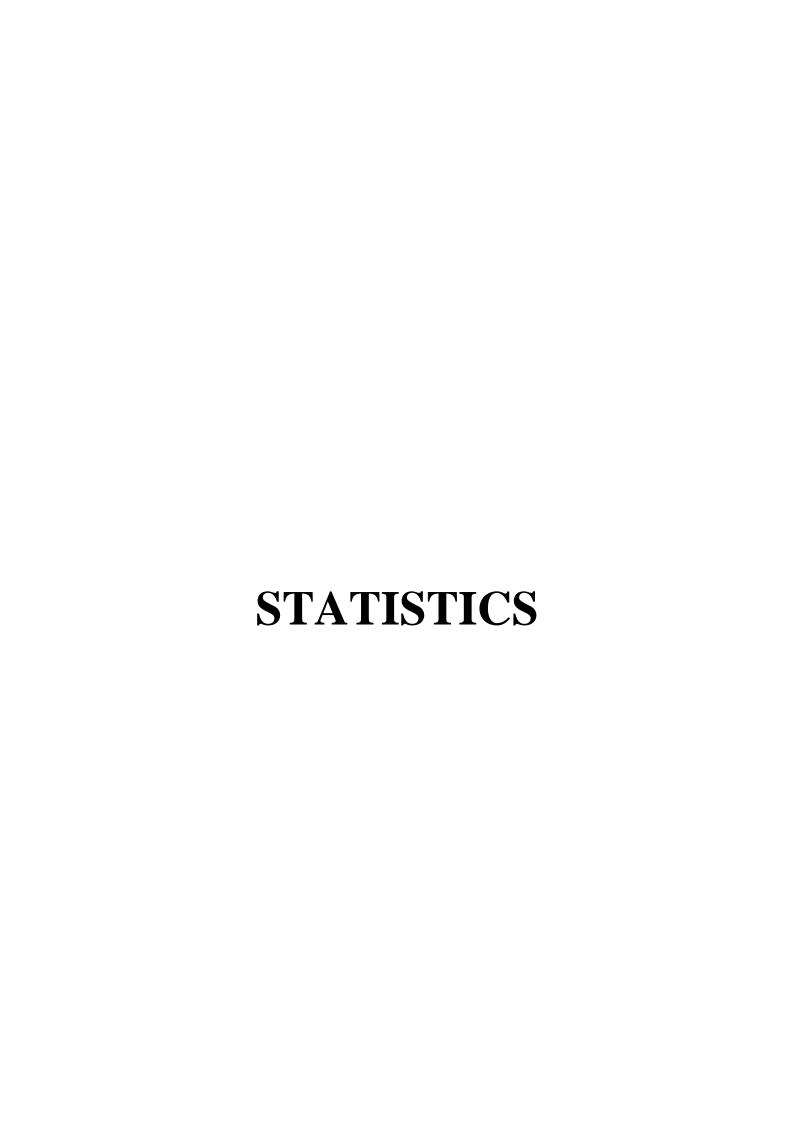
Course Code: 321-II

Course Objectives: This course will help students understand the issues regarding data collection, Processing organizing and Presentation. A particular emphasis will be placed on developing the ability to interpret the numerical information that forms basic of decision making in business.

After the successful completion of this course, students should be able to

After the suc	cessful completion of this course, students should be able to
CO-1	Explain nature, scope in different fields, importance & limitations of statistics, graphical representation of collected data.
CO-2	Describe the concept of statistical averages, uses and application of central tendency and measure of dispassion.
CO-3	Explain concept of correlation analyze and interpret covariance and correlation coefficient, illustrate ordinary least squares & use it to estimate regression coefficient.
CO-4	Describe the components of time series, apply time series analysis in business scenario, illustrate different type of index number & calculate it.
CO-5	Demonstrate the basic concept of probability, probability theorem,

and concept of hypothesis and research types.



Gov	Govt. Holkar (Model Autonomous) Science College, Indore	
	Department of STATISTICS	
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	Class- B. Sc. I Year	
	Title of the Paper (Course) (Paper-I): Statistical Methods	
	Course Code: 119-I	
Course	Course Objectives: The main objective of this course is to acquaint students with	
basic cor	basic concepts in Statistics. They will be introduced to some elementary statistical	
methods	methods of analysis of data.	
	Course Outcome	
After the	successful completion of this course, students should be able to	
CO-1	Organize of numerical data, tabulate, presentation, study, analyze, interpret	
	and compute different measures of central tendency.	
CO-2	Compute various measures of dispersion, skewness and kurtosis.	
CO-3	Compute the correlation coefficient for bivariate data and interpret it.	
CO-4	Compute the multiple regression, partial regression and multiple	
	correlation coefficient, partial correlation coefficient.	
CO-5	Analyze and Interpret qualitative data.	

Title of the Paper (Course) (Paper-II): Probability & Probability Distribution		
	Course Code: 119- II	
Course Ob	jectives: The main objective of this course is to acquaint students with	
basic conce	pts in probability and probability distributions.	
	Course Outcome	
	After the successful completion of this course, students should be a clear	
understandi		
CO-1	Ability to distinguish between random and non-random experiments,	
	knowledge to conceptualize the probabilities of events, conditional	
	probability, deriving theorems of probability and their applications,	
	concept of Baye's Theorem.	
CO-2	The fundamental concept of random variable, distribution functions,	
	discrete and continuous probability distributions including expectation	
	and moment generating function.	
CO-3	Discrete probability distributions such as binomial, poisson, geometric,	
	negative binomial and hyper-geometric.	
CO-4	Continuous probability distributions such as normal, uniform,	
	exponential, beta and gamma distributions.	
CO-5	Weak and strong law of large numbers and their uses, concept of central	
	limit theorem and its uses in statistics.	

Govt. Holkar (Model Autonomous) Science College, Indore		
	Department of STATISTICS	
	Class- B. Sc. II Year	
	Title of the Paper (Course) (Paper-I): Statistical Inference	
Course Code: 219-I		
Course	Course Objectives: Drawing inference about the unknown population parameters	
based or	based on random samples. Validating estimation about the population using	
hypothes	is testing.	
	Course Outcome	
After the successful completion of this course, students should be able to		
CO-1	Different methods of finding point estimators for unknown population	
	parameters, find best point estimators using Cramer-Rao inequality.	
CO-2	Construct most powerful tests to test hypotheses regarding unknown	
	population parameters (Using Neyman-Pearson Lemma and Likelihood	
	Ratio tests).	
CO-3	Test of hypothesis using non-parametric tests.	
CO-4	Chi-square distribution, t and F distributions and their applications.	
CO-5	Hypothesis testing based on a single sample and two samples, analyze	
	categorical data by using chi-square techniques.	

Title of the Paper (Course) (Paper-II): Sampling Techniques		
	Course Code: 219- II	
Course Objectives: Techniques for selecting a sample from a population keeping in		
mind the objectives to be fulfilled and obtain estimator of the population parameter		
from selected sample and study its properties.		
Course Outcome		
After the successful completion of this course, students should be able to understand		
CO-1	Concepts of population and sample, concepts of survey, sampling error.	
CO-2	Simple random sampling and its merits & demerits.	
CO-3	Stratified random sampling and its merits & demerits.	
CO-4	Systematic sampling and its comparison with simple random sampling	
	and stratified random sampling.	
CO-5	Ratio and regression methods of estimation.	

	Department of STATISTICS	
	Class- B. Sc. III Year	
	Title of the Paper (Course) (Paper-I): Applied Statistics	
	Course Code: 319-I	
Course Objectives: The main objective of this course is to acquaint students with some basic concepts in applied statistics. They will be introduced to concept of handful knowledge demographic methods, index numbers, time series and demand analysis.		
	Course outcome	
After the successful completion of this course, students should be able to		
CO-1	Describe basic demographic indicators and elaborate on their computation and interpretation, apply direct and indirect methods of standardization and understanding mathematical relationships in a life table.	
CO-2	Understand measurement of fertility rates, estimate the rate of change in a population.	
CO-3	Concepts of index numbers, construction of price index number, quantity Index numbers and cost of living index number.	
CO-4	Learn time series data, its applications to various fields, understand different components of time series with applications, obtain trend and	

Title of the Paper (Course) (Paper-II): SQC and Design of Experiment Course Code: 319- II

Understand laws of demand and supply, elasticity of demand and supply.

seasonal variation using different approaches.

CO-5

Course Objectives: This course will give technical exposure to student of statistical quality control and design of experiments, analyze and interpret data, design and conduct experiments.

	Course outcome	
After the s	After the successful completion of this course, students should be able to	
CO-1	Develop understanding of statistical process control, control charts for variables and attributes.	
CO-2	Develop understanding of statistical product control, sampling inspection plans for attributes.	
CO-3	Techniques of analysis of variance and covariance under fixed effects model.	
CO-4	Learn fundamental concepts of design of experiments, completely randomized design and randomized block design.	
CO-5	Learn concept of latin square design, efficiency relative to CRD and RBD, factorial designs with two and three levels.	

Govt. Holkar (Model Autonomous) Science College, Indore

	Department of STATISTICS	
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	Class- M. Sc. I Sem	
Т	itle of the Paper (Core Paper-I): Linear Algebra	
	Course Code: S-11	

Course Objectives: The main objective of this course is to develop an algebraic and geometric understanding of linear equations, systems of linear equations and linear transformations. Identify linear operations, implement them as matrices in a given basis, and solutions to equations using matrix algebra.

	Course outcome	
After the	successful completion of this course, students should be able to	
CO-1	Describe vector space, vector subspace, its basis and dimension.	
CO-2	Understand inner product space, Schwartz inequality, orthogonalization	
	process, Cramer's rule.	
CO-3	Understand linear transformation and matrices.	
CO-4	Understand bilinear forms, quadratic forms, orthogonal reduction of	
	quadratic forms.	
CO-5	Obtain eigan value, eigan vectors, characteristic equation and solve	
	Cayley-Hamilton theorem.	

	Title of the Paper (Core Paper-II): Distribution Theory-I
	Course Code: S-12
Course	Objectives: The main objective of this course is to acquaint students with
some bas	sic concepts in random variable and distributions.
	Course outcome
After the	successful completion of this course, students should be able to
CO-1	Understand Concept of random variable, discrete and continuous
	probability density function and mathematical expectation.
CO-2	Understand standard discrete distributions.
CO-3	Understand continuous distributions-uniform, exponential, gamma, beta
	and Cauchy.
CO-4	Understand normal, lognormal, Laplace, Pareto, Weibull and power series
	distribution.
CO-5	Understand concept of order statistics.

	Course Code: S-13	
	jectives: Techniques for selecting a sample from a population keeping in	
mind the ob	pjectives to be fulfilled and obtain estimator of the population parameter	
from selecte	ed sample and study its properties.	
Course outcome		
After the su	ccessful completion of this course, students should be able to	
CO-1	Describe simple random sampling and stratified random sampling.	
CO-2	Explain gain in precision in stratified sampling for proportions and ratio	
	estimators	
CO-3	Understand concept of regression estimate and systematic sampling.	
CO-4	Understand and explain cluster sampling.	
CO-5	Explain the concept of two-stage sampling and double sampling	

Title of	the Paper (Core Paper-IV): Measure Theory and Probability
	Course Code: S-14
Course Ob	jectives: The main objective of this course is to acquaint students with
basic know	ledge of measure theory needed to understand probability theory, statistics
and function	nal analysis.
	Course outcome
After the su	accessful completion of this course, students should be able to
CO-1	Understand sets, sigma fields, lim. superior, lim. inferior, basic concepts
	of measure and probability measure.
CO-2	Explain Lebesgue and Lebesgue - Steljes measures, random variable,
	convergence in probability and measure.
CO-3	Explain integration of a measurable function and monotone convergence
	theorem.
CO-4	Understand Borell-Cantelli lemma, week and strong law of large number
	and Markov dependence.
CO-5	Explain convergence in distribution, characteristic function, uniqueness
	theorem.

Department of STATISTICS	
Class- M. Sc. II Sem	
Title of the Paper (Core Paper-I): Real Analysis	
Course Code: S-21	

Course Objectives: The main objective of this course is to acquaint students with basic analysis topics with a focus on preparing you the fundamentals of mathematical analysis for first year master courses. Topics covered will include real numbers, sequences and series, functions.

Course outcome	
After the successful completion of this course, students should be able to	
CO-1	Explain set theory, real number, Bolzano-Weirstrass and Heine-Borel
	theorems.
CO-2	Describe sequences, series and real valued function.
CO-3	Explain sequences of function, uniform convergence and power series.
CO-4	Compute differentiation and maxima-minima of functions.
CO-5	Compute multiple integration, uniform convergence in improper integrals
	and differentiation under integral sign.

Title of the Paper (Core Paper-II): Distribution Theory-II	
	Course Code: S-22
Course Ob	jectives: The main objective of this course is to develop solid knowledge
in basic dis	tribution theory in order to facilitate future research and concept of a test
function an	d its importance in the theory of distributions
	Course outcome
After the su	accessful completion of this course, students should be able to
CO-1	Explain two-dimensional distribution function and independence in two
	variables.
CO-2	Understand and compute simple correlation, regression and bivariate
	normal distribution.
CO-3	Explain sampling distributions and its arising from univariate normal
	distribution.
CO-4	Describe non-central chi-square, t and F distribution.
CO-5	Understand how distribution arising from the bivariate normal and
	sampling distribution of correlation coefficient 'r'.

Title of the Paper (Core Paper-III): Statistical Computing Course Code: S-23

Course Objectives: The main objective of this course is to enable students with essential computations and statistical analysis using commonly used statistical software. The goal of course is to familiar student to use statistical language for research.

Course outcome	
After the successful completion of this course, students should be able to	
CO-1	Understand how statistics role for national development.
CO-2	Understand basic of computers.
CO-3	Programming in FORTRAN.
CO-4	Develop simple programs in FORTRAN.
CO-5	Apply statistical package SPSS.

Title of the Paper (Course) (Paper-IV): Statistical Inference-I

Course Code: S-24

Course Objectives: The main objective of this course is to enable students to derive suitable point estimators of the parameters of the distribution of a random variable and give a measure of their precision and learn various statistical inferential approaches. To perform Test of Hypothesis as well as obtain MP, UMP tests

or F	1 71	
	Course outcome	
After the su	accessful completion of this course, students should be able to	
CO-1	Know the properties of good estimators.	
CO-2	Understand fundamental paradigms of the foundations of statistics	
	inference, e.g., unbiased minimum variance estimation, the Cramér-Rao	
	inequality, the Rao-Blackwellization.	
CO-3	Use methods of estimation to estimate parameters.	
CO-4	Construct most powerful tests to test hypotheses regarding unknown	
	population parameters (Using Neyman-Pearson Lemma).	
CO-5	Explain likelihood ratio test.	

Gov	t. Holkar (Model Autonomous) Science College, Indore		
	Department of STATISTICS		
	•••		
	Class- M. Sc. III Sem		
	Title of the Paper (Core Paper-I): Multivariate Analysis		
	Course Code: S-31		
scientific research	Objectives: The main objective of this course is to enable students with view to deal with multidimensional datasets and its uses in the analysis of data. To understand the extensions of univariate techniques to multivariate rks and learn to apply data reduction techniques used in the data analysis.		
Hamewo	Course outcome		
After the	successful completion of this course, students should be able to		
CO-1	Know the multivariate normal distribution and its properties.		
CO-2	Fined maximum likelihood estimate and variance-covariance matrix.		
CO-3	Explain null and non-null distribution of correlation coefficient.		
CO-4	Describe Hotelling's T ² statistic and application in tests on multivariate normal distribution.		
CO-5	Understand classification of the two populations with known probability distribution.		

Title of the Paper (Core Paper-II): Linear Models	
Course Code: S-32	

Course Objectives: The main objective of this course is to acquaint students with a deeper understanding of the Markov model, linear and non-linear regression models. to develop regression model and apply for the specific perspective data in appropriate manner.

Course outcome	
After the successful completion of this course, students should be able to	
CO-1	Know the Gauss-Markov model and fined its BLUE.
CO-2	Obtained variances and covariances of least square estimates.
CO-3	Explain Tests of hypothesis for linear parametric function, Tukey and
	Scheffe test.
CO-4	Describe one way random effect linear models and multiple regressions.
CO-5	Understand non-linear models and Ridge regression.

Title of the Paper (Elective-1 Paper-III-A): Operations Research Course Code: S-33

Course Objectives: The main objective of this course is to enable students to develop the optimization techniques, learn the mathematical formulation of complex decision-making problems and arrives at optimal solutions using different techniques of operations research which will be useful in real world.

	Course outcome	
After the su	After the successful completion of this course, students should be able to	
CO-1	Understand the application of OR and frame a LP Problem with solution.	
CO-2	Solve revised simple and explain the relationship between a linear program and its dual.	
CO-3	Build and solve transportation problems, assignment problems and goal programming using appropriate method.	
CO-4	Describe the theoretical workings of the solution methods for integer linear programming problems and its applications.	
CO-5	Explain the theoretical workings of the solution methods for non-integer linear programming problems.	

Title of the Paper (Elective-1Paper-III-B): Demography Course Code: S-33

Course Objectives: The main objective of this course is to acquaint students with demographic data, use different measures for demographic analyses using various techniques across populations. To learn the theories used to understand population studies.

	Course outcome	
After the su	After the successful completion of this course, students should be able to	
CO-1	Understand the basics of demography, measures of mortality, construct	
	and analyze simple and abridged life-tables.	
CO-2	Understand the measures of fertility and estimate the rate of change in a	
	population.	
CO-3	Estimate population using logistic curve and Makehan's graduation	
	formula.	
CO-4	Project a population using appropriate equations and assumptions.	
CO-5	Understand the Poisson processes, linear birth and death processes and	
	models.	

Title of the Paper (Elective-2 Paper-IV-B): Statistical Inference-II			
Course Code: S-34			
Course Objectives: To learn various element of decision theory, sequential analysis,			
non parametric methods, order statistics and test for one and two sample used in			
research.			
	Course outcome		
After the successful completion of this course, students should be able to			
CO-1	Understand decision theory, loss function, risk function, point and		
	interval estimation as a decision problem, Bayes and minimax		
	estimators.		
CO-2	Apply sequential analysis problems on real life examples.		
CO-3	Implement non-parametric statistical tests, order statistics and their		
	distribution, rank correlation between ranks and variate values, treatment		

Title of the Paper (Elective-2 Paper-IV-A): Programming with Language
'C'

Apply one sample problems on real life examples.

Apply to sample problems on real life examples.

of ties in ranks.

CO-4 CO-5

Course Code: S-34

Course Objectives: The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications of C.

Course outcome	
After the successful completion of this course, students should be able to	
CO-1	Understand the fundamentals of C programming.
CO-2	Understand and use operators and expressions.
CO-3	Apply input and output functions.
CO-4	Use function, arrays and pointers in progamming.
CO-5	Construct a simple programme related to Statistics in C.

Title of the Paper (Open Elective Paper): Statistical Techniques	
Course Code: S-35	

Course Objectives: To have a proper understanding of Statistical applications for other branch student. To enable the use of statistical, graphical and algebraic techniques wherever relevant

1		
	Course outcome	
After the s	After the successful completion of this course students should be able to	
CO-1	Knowledge of Statistics and its scope and importance in various areas	
	such as medical, engineering, agricultural and social sciences etc.	
	knowledge of various types of data. Evaluation of measures of central	
	tendency.	
CO-2	Evaluation of measures of dispersion, skewness, and kurtosis etc.	
CO-3	Distinguish between random and non-random experiments, events, laws	
	of probability, concept of Bayes' Theorem, concept of discrete and	
	continuous random variables and their probability distributions	
	including mathematical expectation	
CO-4	Knowledge of correlation, regression analysis.	
CO-5	Small sample tests based on chi-square, Students's t and F distributions.	
	Applications of chi-square, Student's t and F distributions. Definition,	
	assumption for ANOVA test, one-way and two-way classifications for	
	fixed effect model with one observation per cell. Introduction to basic	
	principles of design of experiments. Completely Randomized	
	Design(CRD), randomized Block Design(RBD)	

Govt. Holkar (Model Autonomous) Science College, Indore Department of STATISTICS

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Class- M. Sc. IV Sem

Title of the Paper (Core Paper-I): Design of Experiments

Course Code: S-41

Course Objectives: To learn the principles in the design of experiments. To learn tests for comparing pairs of treatment means, ANCOVA, factorial experiments, fractional factorial experiments, confounding, BIBD, PBIBD with solving real life designs in agriculture.

Course outcome

After the successful completion of this course, students shall get basic knowledge

CO-1 to terminology and fundamental principles of design of experiments Completely randomized design(CRD), Randomized Block Design(RBD), Latin square design(LSD), Graeco Latin Square design, Cross Over design

	and their layout and analyses, general theory and application of Missing plot
	technique
CO-2	About analysis of co-variance for one way and to way classification with
	single concomitant variable in CRD and RBD layout respectively, Split plot
	and split block experiments
CO-3	To learn the applications of different designs in agriculture.
CO-4	To learn different tests for comparing pairs of treatment means by BIBD,
	PBIBD
CO-5	About Factorial experiments in randomized block, complete and partial
	confounding

Title of the Paper (Core Paper-II): Statistical Quality Control Course Code: S-42

Course Objectives: To develop scientific view to analyze the industrial data. To learn the statistical quality control techniques used and implemented in industries such as control charts, sampling plans etc. To learn some advanced control chart and the concept of six-sigma.

concept of bix bigina:		
Course outcome		
After the suc	After the successful completion of this course students should be able to	
CO-1	Know and apply the concept of control charts. OC and ARL of control	
	charts, uses of runs	
CO-2	Know and compute control charts based on C.V., Cusum charts, use of	
	V mask.	
CO-3	Apply the acceptance sampling plans in production process. Curtailed	
	and semi curtailed sampling plans	
CO-4	Apply continuous sampling plans in production process.	
CO-5	Know and apply the concept of six sigma,	

Title of the Paper (Elective-1 Paper-III -A): Advanced Operation Research

Course Code: S-43

Course Objectives: The objective of this course is to develop an ability in the students to understand and analyze managerial problems in industry and supply chain management so that they are able to use resources (capitals, materials, staffing, and machines) more effectively, formulate mathematical models for quantitative analysis of managerial problems in industry, develop skills in the use computer tools in solving real problems in industry.

	Course outcome	
After the su	accessful completion of this course, students should be able to	
CO-1	Apply the knowledge of game theory concepts and demonstrate solution	
	methods including graphs and linear programming to analyze and solve	
	the Two-person, zero-sum games.	
CO-2	Identify the goals and objectives of inventory management, explain the	
	various inventory models and extend inventory models to analyse real	
	world systems.	
CO-3	Develop models for repairable systems using renewal process	
CO-4	Understand the queueing systems, compute quantitative metrics of	
	performance for queueing systems and apply the queueing models to	
	analyze real world systems.	
CO-5	Develop mathematical models associated with network flows and related	
	real life applications, to do Critical analysis of project schedule and	
	analyzing the cost-time trade-offs in the context of a project network.	

Title of the Paper (Elective-1 Paper-III -B): Official Statistics Course Code: S-43

Course Objectives: The objective of this course is to develop an ability in the students to understand concept on official statistics used in various organization and industries

industries		
Course outcome		
After the su	After the successful completion of this course, students should be able to	
CO-1	Know the role function and activities of Indian and international system	
CO-2	Know the role of NSSO	
CO-3	Understand population growth, performance of family welfare programs	
CO-4	Know collection of data in agricultural statistics, crop forecasting and estimation	
CO-5	To learn the main theories of statistics related to industries foreign trade, understand cost of living, educational and other social statistics	

Title of the Paper (Elective-2 Paper-IV-A): Econometrics Course Code: S-44

Course Objectives: Objective of the course is to introduce regression analysis to students so that they are able to understand its applications in different fields in economics. Students will be able to specify assumptions, formulate and estimate appropriate models, interpret the results and test their statistical significance. The course emphasizes on the applications of econometrics in different fields of research.

Course outcome		
After the successful completion of this course, students should be able to		
CO-1	Know nature and scope of financial econometrics, Classical linear	
	model and its extension using ordinary least square(OLS). Generalised	
	least square estimation and prediction,	
CO-2	Know meaning of auto- correlation, its consequence on OLS,	
	multicollinearity	
CO-3	Analyze Canonical correlation and discriminant in econometrics	
CO-4	Understand simultaneous linear equation model	
CO-5	Learn recursive models, Simultaneous euation methods	

Title of the Paper (Elective-2 Paper-IV-B): Stochastic Processes Course Code: S-44

Course Objectives: To learn and understand stochastic processes approach. To develop an ability to analyze and apply basic stochastic processes for solving real life situations. The course emphasizes on the application of Stochastic Processes in different fields of research.

Course outcome		
After the successful completion of this course, students should be able to		
CO-1	Understand the stochastic processes, Markov chains, Transition	
	probability matrix and various types of states.	
CO-2	Understand branching processes, statistical inference in MC and	
	Markov process	
CO-3	Understand discrete state space continuous time MC, application to	
	queues and storage problems	
CO-4	Understand renewal theory and application	
CO-5	Understand Wiener process as a limit of random walk, stationery	
	process, moving average and auto regressive process	



Department of English

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Class - B.Sc. I Year

Title of the Paper (Course) Course outcome English Course Code 108

Course Objective -

The course objective is to bridge the gap between Higher secondary and undergraduate and to acquaint the students with basics of English language. The purpose is to develop the comprehensive attitude in reading and writing.

Course Outcome- After the completion of the course -

CO1 The parts of speech will help strengthen and revise their basic knowledge of English.

CO2 Through reading poems of renowned poets, the universal applicability of human emotion is enhanced.

 ${\bf CO3}$ By the introduction of comprehension / unseen passage their reading and writing skills

will improve.

CO4 Situational communicative English will improve the soft skills of the students.

Department of English

Class - B.Sc. II Year

Title of the Paper Course outcome English Course Code 208

Course Objectives-

To prepare the students in developing an understanding in English Language, to develop a comprehensive attitude of the students in reading and writing and to arouse the interest of the students for further studies in English Language and Literature.

Course Outcomes - After the completion of the course.

- CO1 The students know the nature and scope of English

 Language.
- CO2 An attitude of reading and writing has been observed as a result of the studies in Language.
- CO3 Students are successful is developing an understanding of Vocabulary and Grammar

in Language.

- CO4 Students are in a better position to use their writing skills.
- CO5 The courses of study are so designed as to inculcate the interest of the students in learning other language also with perfection, for the purpose of translation.

Department of English

Class - B.Sc. III Year

Title of the Paper Course outcome English Course Code 308

Course Objective:

To educate the students about emotions in poetry and enhance their imagination, to develop the students insight into the structure of the language and to develop their overall

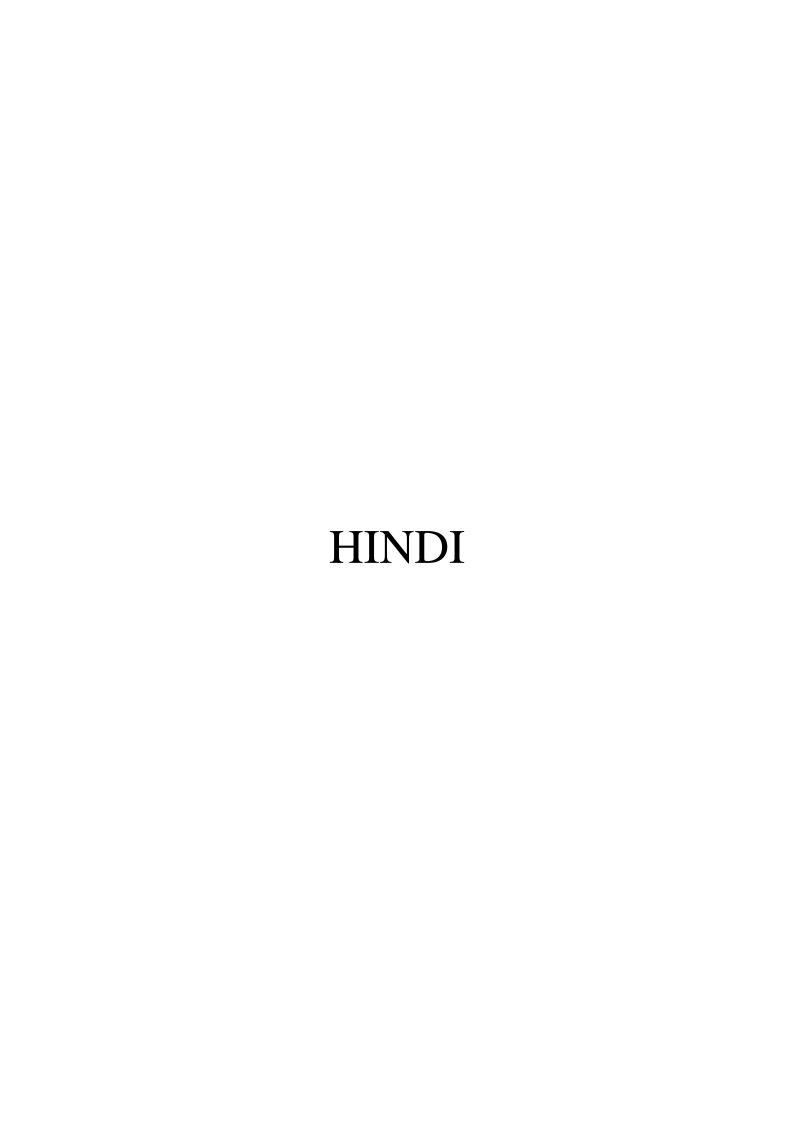
personality.

Course Outcomes – After the completion of the course -

- CO1 The students will be able to identify, analyse and interpret the critical ideas, poetic devices, values and themes that appear in literary texts.
- CO2 The students will understand complex grammatical structure in writing and speaking.
- CO3 With a large vocabulary students will improve all areas of communication listening, Speaking, reading and writing.
- CO4 students will be able to narrate a series of events in an engaging way.
- CO5 Students will be able to make good CV to convince the prospective employer of his employability. The students will also enhance their Communication skills by providing

fast response through emails. Through group discussion and personal interview, their

listening and speaking skills are improved to promote their confidence level.



Department of Hindi

Class - B.Sc. I Year

Title of the Paper(Course) हिन्दी भाषा और नैतिक मूल्य Course Code 109

Course Objectives:

इस पाठ्यक्रम का उद्देश्य प्रथम वर्ष के छात्र / छात्राओं में हिन्दी भाषा को शुद्ध रूप से पढ़ना लिखना सम्मान एवं अभिव्यक्त करने की कला का विकास करना है। हिन्दी भाषा क बारीकियों से विद्यार्थियों को अवगत कराना तथा दिन—प्रतिदिन के व्यवहार में व्यवहार गम्य बनाना है। मातृभाषा के माध्यम से शिक्षा सहज, ग्राह्य और संप्रेष्प होती है। शिक्षा विद्यार्थियों को अच्छा इंसान बनने, शास्वह मानवीय मूल्यों को आत्मसात करने और भविष्य, जीवन संघर्ष में सुचिता पूर्ण साधनों का उपयोग करते हुए सफल होने का मार्ग प्रशस्त करती है। उच्च शिक्षा के क्षेत्र में भाषा साहित्य एवं संस्कृति के अन्तः संबंधों को लेकर नई सजगता जरूरी है जो जीवन में सकारात्कता लाने के साथ—साथ मानव व्यांकत्व के निर्माण में सहायक होगें। नैतिक मूल्यों की शिक्षा से उदार भावनाओं का निर्माण एवं विस्तार होगा। नैतिकता ही वह पथ है जिसके माध्यम से समान आगे भयमुक्त होगा। कुछ प्रमुख उद्देश्य इस प्रकार है —

- 1. वाक्य संरचना सीखना तथा इसमें होने वाली अशुद्धियों से परिचय कराना।
- 2. पर्यायवाची एकार्थी, अनेकार्थी, शुद्ध युग्म का प्रयोग करना सिखाना।
- पल्लवन, तथा संक्षेपण जैसी विधाओं से अवगत कराना।
- विभिन्न निबंधों एवं कविताओं के माध्यम से नैतिक मूल्यों का विकास करना।

Course Outcomes:

इस पाठ्यक्रम के पूर्ण होने पर विद्यार्थियों में सृजनात्मक प्रतिभा के साथ—साथ मौलिक सोच उत्पन्न होती है। विद्यार्थियों में कुंठा, दिशाभ्रम, हताशा के स्थान पर आत्मविश्वास जीवन लक्ष्य के प्रति सजगता एवं नैतिकता बलवती होती है। विशेषकर निम्न परिणाम प्राप्त होते दिखाई देते है —

- CO1 विद्यार्थी हिन्दी भाषा शुद्ध रूप से लिखना पढ़ना, बोलना सीखते है साथ ही वे वाक्य संरचना में त्रुटिया नहीं करते।
- CO2 विद्यार्थी अलग—अलग शब्दों के स्थान पर शब्द युग्मों का प्रयोग करते है। इसी प्रकार विभिन्न पर्यायवाची शब्दों का प्रयोग करना भी सीख जाते है।
- CO3 अपनी बात को संक्षेप में किस प्रकार कहना है तथा आवश्यकता पड़ने पर किसी विषय का विस्तार कैसे करना है यह भी सीख जाते है।
- CO4 विभिन्न निबन्धों के अध्ययन से उनके जीवन पर प्रभाव स्पष्ट दृष्टिगोचर होता है। पुष्प की अभिलाषा जैसी विद्यार्थियों को अपने देश पर सब कुछ न्यौंछावर कर देने की प्रेरणा देती है। वही लोकतंत्र एक धर्म है। जैसे निबंधों से उनकी लोकतंत्र में निष्ठा और गहरी हो जाती है। नैतिक मूल्यों से संबंन्धित विभिन्न आलेख विद्यार्थियों को संयमित एवं समाज उपयोगी जीवन जीने की दिशा प्रदान करते है। नैतिक मूल्यों के विभिन्न दृष्टांत उन्हें एक श्रेष्ठ नागरिक बनाते है।
- CO5 नैतिक मूल्यों से संबंध्ति विभिन्न आलेख विद्यार्थियों को संयमित एवं समान उपयोगी जीवन जीने की दिशा प्रदान करते है। नैतिक मूल्यों के विभिन्न दृष्यंत उन्हें एक श्रेष्ठ नागरिक बनाते है।

Department of HIndi Class - B.Sc. II Year

Title of the Paper(Course) हिन्दी भाषा और नैतिक मूल्य Course Code 209

Course Objectives:

हिन्दी भाषा पढ़ाने का उद्देश्य विद्यार्थियों को परंपरा, जीवन मूल्य, समाज व्यवस्था, राष्ट्रीय उपलिखयों और विकास की दिशाओं से परिचित कराना है। हिन्दी भाषा का पाठ्यक्रम इस प्रकार निर्धारित किया गया है कि विद्यार्थियों में संप्रेषण कौशल के साथ-साथ भारतीय चिंतन परंपराओं से भी अवगत हो सकें। पाठ्यक्रम के प्रमुख उद्देश्य इस प्रकार है -

- 1. भाषा व्याकरण का ज्ञान भाषा को शुद्ध बनाता है। इस हेतु स्वर-व्यंजन की पहचान, वर्गीकरण उच्चारण का स्थान तथा विभिन्न विराम चिन्हों के उपयोग से अवगत कराना।
- संधि एवं समाज ऐसी विधाऐं है जिसमें भाषा शसकत बनती है अतः विभिन्न प्रकार की संधि एवं समाज से अवगत कराना।
- विद्यार्थियों में प्रखर राष्ट्रवाद भी भावना पैदा करना।
- विद्यार्थियों में देश में व्याप्त विभिन्न समस्याओं के प्रति वैज्ञानिक चिन्तन मनन की प्रवृत्ति को बढावा देना।
- महान व्यक्तियों एवं साहित्यकारों के लेख, व्याख्यान एवं निबन्धों द्वारा उत्कृष्ट नैतिक मूल्यों से अवगत कराना तथा जीवन में अपनाने हेत् विद्यार्थियों को प्रवृन्त करना।

Course Outcomes:

इस पाठ्यक्रम को पढ़ाये जाने पर विद्यार्थियों में भाषागत क्षमताओं के विकास के साथ-साथ भारतीय चिन्तन परम्परा का ज्ञान भी वे प्राप्त करते है। पाठ्यक्रम के अध्ययन से, विशेषकर निम्न परिणाम प्राप्त होते है -

- CO1 स्वर-व्यंजनों की स्पष्ट पहचान एवं विभिन्न विराम चिन्हों के उचित उपयोग से उनकी भाषा शुद्ध होती। परिमाषित भाषा में उपयोग से विद्यार्थियों का संप्रेषण कौशल बढ़ता भी और प्रभावी भी होता है।
- CO2 विभिन्न संधियों के प्रयोग से विद्यार्थी कम शब्दों में अधिक व्यक्त करने की विधा सीख जाते है। कही या गद्य का संक्षेपण प्रभावी तरीके से करने में सफल होते है।
- CO3 'दिमागी गुलामी' जैसे निबन्ध एवं 'धर्म एवं राष्ट्रवाद' जैसे लेख विद्यार्थियों में प्रखर राष्ट्रवाद की भावना उत्पन्न करते है जिससे हमारा देश शक्तिशाली बनता और तेजी से विकास की ओर अग्रसर होता है।
- CO4 'वह तोड़ती पत्थर' जैसी कविता में जिस तरह समाज में व्याप्त आर्थिक विषमता को प्रकट किया है, वह विद्यार्थियों के मन को झकझोर कर रख देती हैं। एक मां ने अपने बेटे के लिये जीवन पर्यन्त संघर्ष किया किन्तु स्वार्थी बेटे ने उसके संघर्ष एवं बलिदान का उपहास करते हुए उसे केवल पदोन्नित प्राप्त करने का साधन मान लिया। "चीफ की दावत" कहानी विद्यार्थियों के अन्तर्मन पर गहरा प्रभाव डालती है।

CO5 'विभागों व्याख्यान' जहाँ विद्यार्थियों में हिन्दू संस्कृति एवं धर्म भी महन्ता को उनके मन पर अमिट स्याही की तरह अंकित करता है वहीं महात्मा गाँधी की आत्म कथा "सादगी" जीवन में अनुशासनए स्वावलम्बन, नियमितता, सदाचार एवं सत्य जैसे नैतिक मुल्यों का अपनाने की प्रेरणा प्रदान करती ळें

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