

AC/I(21-22).2(II).RPS3

S. P. Mandali's
Ramnarain Ruia Autonomous College
(Affiliated to University of Mumbai)



RUIA COLLEGE

Explore ● Experience ● Excel

Syllabus for

Program: Msc Part I

Program Code: RPSBTK

(Choice based Credit System for Academic
Year 2022–23)

GRADUATE ATTRIBUTES

GA	GA Description
GA	A student completing Bachelor's Degree in Science program will be able to:
GA1	Demonstrate in depth understanding in the relevant science discipline. Recall, explain, extrapolate and organize conceptual scientific knowledge for execution and application and also to evaluate its relevance.
GA 2	Critically evaluate, analyze and comprehend a scientific problem. Think creatively, experiment and generate a solution independently, check and validate it and modify if necessary.
GA 3	Access, evaluate, understand and compare digital information from various sources and apply it for scientific knowledge acquisition as well as scientific data analysis and presentation.
GA 4	Articulate scientific ideas, put forth a hypothesis, design and execute testing tools and draw relevant inferences. Communicate the research work in appropriate scientific language.
GA 5	Demonstrate initiative, competence and tenacity at the workplace. Successfully plan and execute tasks independently as well as with team members. Effectively communicate and present complex information accurately and appropriately to different groups. Use an objective, unbiased and non-manipulative approach in collection
GA 6	and interpretation of scientific data and avoid plagiarism and violation of Intellectual Property Rights. Appreciate and sensitive to environmental and sustainability issues and understand its scientific significance and global relevance.
GA 7	Translate academic research into innovation and creatively design scientific solutions to problems. Exemplify project plans, use management skills and lead a team for planning and execution of a task.
GA 8	Understand cross disciplinary relevance of scientific developments and relearn and reskill so as to adapt to technological advancements.

PROGRAM OUTCOMES

PO	Description A student completing Bachelor's Degree in Science program in the subject of Biotechnology will be able to:
PO 1	Perceive the fundamental and advanced concepts in depth in the areas of biochemistry, molecular biology, immunology, medical microbiology and applying the conceptual knowledge to address thereal time problems and exploring plausible solutions.
PO 2	Annotate the vast amount of biological data by retrieving, processing andanalyzing through various tools of bioinformatics and biostatistics.
PO 3	Criticize and assess the phases encountered from laboratory to premarketing stages in clinical research along with reviewing case studies.
PO 4	Identify local and global environmental issues and establish scientific strategies to devise economical solutions converging towards sustainable development
PO 5	Comprehend the process of patent documentation .Employ the relevance of legal and ethical implications in intellectual property rights, GMO ,developmental biology and other fields of biotechnology.
PO 6	Outline, execute ,Analyze experimental procedures and research proposal thus ameliorate their scientific writing temperament and soft skills consequently refining their abilities to troubleshoot any research problems.
PO 7	Deduce the underlying principle of nanotechnological and biotechnological processes and develop the skills to offer contemporary solutions.

PROGRAMME OUTLINE

Msc Part 1 – (CBCS)

YEAR	SEMESTER	COURSE CODE	COURSE TITLE	Course Type	CREDITS
MSC I	I	RPSBTK101 (Core Course)	Biochemistry	CC	4
		RPSBTK102 (Core Course)	Immunology	CC	4
		RPSBTK103 (Core Course)	Molecular Biology	CC	4
		RPSBTK104 (Discipline Specific course)	Clinical data Management	DSE	4
		RPSMIC104 (Discipline Specific course)	Clinical Microbiology and Epidemiology	DSE	
		RPSBCH104 (Discipline Specific course)	Plant Biochemistry	DSE	
		RPSBTK105 (Ability Enhancement Course)	Emotional well-being through Logic-based thinking	AEC	2
		RPSBTKP101	Practical I	-	2
		RPSBTKP102	Practical II	-	2
		RPSBTKP103	Practical III	-	2
		RPSBTKP104	Practical IV	-	2
				RPSBTK201 (Core Course)	Metabolism

MSC I	II	RPSBTK202 (Core Course)	Immunology	CC	4
		RPSBTK203 (Core Course)	Bioinstrumentation	CC	4
		RPSBTK204 (Discipline Specific course)	Nanotechnology	DSE	4
		RPSMIC204 (Discipline Specific course)	Microbial Approaches to Quality Management	DSE	4
		RPSBCH204 (Discipline Specific course)	Nutraceuticals & Functional Foods	DSE	
		RPSBTK205 (Ability Enhancement Course)	Intellectual Property rights	AEC	2
		RPSBTKP201	Practical I	-	2
		RPSBTKP202	Practical II	-	2
		RPSBTKP203	Practical III	-	2
		RPSBTKP204	Practical IV	-	2

SEMESTER I

Course Code: RPSBTK101

Course Title: Biochemistry

Core Course-1

Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Elucidate the concept of different types of complicated carbohydrate molecules ,their structure and analytical methods for detection
CO 2	Differentiate between biosynthesis of nucleic acids and its consequences in dysregulation of it.
CO 3	Assess physiological significance of important co factors and molecules like lipids, peptides, endorphins, prostaglandins vitamins and co enzymes
CO 4	Discuss different types of inborn errors related to metabolism ,glycogenstorage, amino acid metabolism, nucleic acid metabolism
CO 5	Enumerate the concept of Neurobiology and establish a basic link to the immune system.
CO 6	Demonstrate practical skills in analyzing biomolecules in various biological samples and understand their significance.

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Lecture s
RPSBTK101	I	Biochemistry of mucopolysaccharide and nucleicacid Glycosaminoglycans- Heparin, Chondroitin-sulphate, Dermatan-sulphate, Keratan-Sulphate. Analytical methods for carbohydrate analysis. Formation , structure and functions of Eicosanoid: Prostaglandins and Thromboxanes, Glycoprotein's (N6, O6, GPI6 linked and proteoglycans),	15

		Glycolysis and of lipines, and Biosynthesis with regulation.	
	II	<p>Protein Biochemistry</p> <p>Primary structure of proteins and their determination- end group analysis, cleavage of disulphide bond, characterization of polypeptide cha, aminoacid composition determination, specific peptide cleavage reaction, separation and purification of peptides, sequence determination, peptide mapping, Super secondary structures. Secondary structure peptide group, Ramchandranplot, helical structure, beta structure, fibrous and globular structure, protein stability, electrostatic forces, hydrogen bond, hydrophobic interaction, disulphide bond, protein denaturation, stability of thermostable proteins. Quaternary structure- subunit interaction, symmetry, subunit composition determination.</p>	15
	III	<p>Inborn errors of metabolism and nutritional disorders</p> <p>PEM (Kwashiorkor and Marasmus). Diabetes: Type I, Type II, gestational. Glycogen storage disorders - von Gierke's disease, Cori's disease, Andersen's disease, McArdle's disease. Amino acid metabolism- PKU, Alkaptonuria. Lipids- Tay-Sachs, Gaucher's disease. Nucleic acids- Gout, Lesch- Nyhan syndrome. Role of B group Vitamins in metabolic pathways</p>	15
	IV	<p>Neurobiology and Neurochemistry</p> <p>Structure and functions of neuron, types and physiologic anatomy of the Synapse, transmission of nerve impulses, ion channels, Neurotransmitters and neuropeptides Electrical events during neuronal excitation and inhibition. Neurotoxins.</p>	15

		<p>Neurochemistry: Special senses-taste, vision, odor, hearing. Factors which enhance epinephrine inhibitors ,Synapses, Addictions.Examples of each of the above mentioned factors. Introduction to psychoneurotic and neuropsychiatric drugs.</p>	
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References:

1. Guyton, Text book of Medical Physiology, Saunders Publishers, 12th edition,2010
2. Textbook of Biochemistry with Clinical Correlations, 7thEdition, Thomas M.Devlin, January2010,
3. Proteins: biotechnology and biochemistry,1stedition(2001),Gary Walsch, Wiley, USA
4. Biochemical Calculations, 2nd Ed., (1997) Segel Irvin H., Publisher: John Wiley and Sons, NewYork.
5. Enzymes: Biochemistry, Biotechnology & Clinical chemistry, (2001)Palmer Trevor, Publisher: Horwood Pub .Co .England.
6. Outlines of Biochemistry: 5th Edition, Eric Conn &PaulStumpf ; John Wiley and Sons, USA
7. Fundamentals of Biochemistry. 3rd Edition (2008), Donald Voet& Judith Voet , John Wiley and Sons, Inc.USA
8. Lehninger,Principles of Biochemistry.5thEdition(2008),David Nelson &Michael Cox, W.H. Freeman and Company ,NY.

Course Code: RPSBTKP101

Course Title: Practicals based on RPSBTK101

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTKP101	1. Preparation of buffers used in laboratory (Phosphate , Citrate , Acetate and Trisbuffer) 2. Isolation of starch from potato and its estimation by Anthrone method. 3. Study of phosphorolysis of glycogen in the Muscular tissue. 4. Glucose estimation by paper/chip –Microfluidics 5. Study of protein complexes using PAGE and detection by CBB and silver staining. 6. The isolation and assay of glycogen from liver and skeletal muscles of bird /mammal. 7. Estimation of Vitamin C from fruits. 8. Estimation of Creatinine in blood /urine. Estimation of urate /creatinine ratio to diagnose Lesch-Nyhan syndrome 9. Chemistry of thinking: a. Study of different regions of brain using models. b. Stroop test and blind spot test. c. Color blindness and optical illusions 10. Detection of LDH isozymes by electrophoresis.	2

Course Code: RPSBTK102

Core Course-2

Course Title: Immunology
Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Elucidate the concept of antigen presentation and recognition patterns
CO 2	Analyze the basics, role and differentiate between complement pathways.
CO 3	Comment on role and function of Cytokines and cytokine profiling and interpret the role of oncogenes and different tumors of immune system
CO 4	Discuss methods and procedure of safe sterile Vaccine development
CO 5	Criticize the path chosen by different effector molecules under various threats to immune system
CO 6	Show the skills to develop ,execute immuno based assays

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Lectures
RPSBTK102	I	Molecular immunology Organization and expression of immunological genes (BCR and TCR genes). Antibody genes and antibody engineering. T cell and B cell activation .Inflammation Key mediators of inflammation inflammation process, anti inflammatory drugs	15
	II	Cancer Immunology Origin and terminology, malignant transformation of cell, oncogenes and cancer	15

		induction, tumors of the immune system, tumour antigens, immune response to tumor,	
	III	Clinical immunology Cytokines: properties, receptor, antagonists, diseases, Therapeutic use of cytokines, Experimental immunology: Vaccine development (Recombinant, Combined , polyvalent vaccines, RNA ,conjugate vaccines)Cancer Immunology – Correlation with MABS, Chimeric humanized antibodies and Notations, Cytokine profiling of T – cells Effector mechanisms:	15
	IV	Mucosal immunity, Peyer’s patches, gut barriers, oral immunization, Oral tolerance, Cytotoxic response, Effector functions of B, T and NK cells. Immune response during bacterial, parasitic, viral infection with one example of each.	15

References:

1. Immunology by Janis Kuby, W.H. Freeman & Co Ltd; 5th Revised edition.
2. Fundamental Immunology 6th edition (August 2003): by William E., Md. Paul (Editor) By Lippincott Williams & Wilkins Publishers
3. Essential Immunology, Ivan M. Roitt (1994)– Blackwell Scientific Pub, Oxford.
4. Cellular and Molecular Immunology, 3rd Ed, Abbas, Saunders; 7 edition (11 June 2011)

Course Code: RPSBTKP102

Course Title: Practicals based on RPSBTK102

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTKP102	<ol style="list-style-type: none">1. Antigen antibody reactions: VDRL2. Immuno-diffusion and immune-electrophoresis3. Perform Serum protein electrophoresis.4. Perform DOTBLOT5. Separation of T lymphocytes and B lymphocytes using nylon wool column6. Sheep RBC rosetting	2

Course Code: RPSBTK103
Course Title: Molecular Biology
Core Course-3
Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Construct the details of chromatin structure and its functional implications.
CO 2	Elucidate the basis of gene expression and basic control processes involved in it
CO 3	Comment on different post translational events , the underlying functional importance along with concepts of protein folding ,transport and protein sorting
CO 4	Explain the techniques and principles involved in various next generation sequencing methods as an important aid the field of genomics
CO 5	Acquire the skills to perform advanced molecular biology techniques
CO 6	Interpret the functionality and importance of epigenetics and RNA interference

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Lectures
RPSBTK103	I	Chromatin structure and gene Expression Chromatin structure and transcription. Regulation of chromatin structure , Transcription in prokaryotes and Eukaryotes, Structure of RNA polymerase (Channel in and Channel out). Types of RNA polymerases, Types of Promoters, initiation, elongation, termination and	15

		anti-termination .Initiationfactor, role of transcription factors, Regulation of RNA polymerase. Transcription in cell organelles (Mitochondria and chloroplast).	
	II	Post transcriptional events : RNA processing in eukaryotes: modifications, splicing and splicing machinery, processing of RNA. Editing and amplification Translation: in Prokaryotes and Eukaryotes. Initiation, elongation, and termination ,mRNA localization and stability. Modification folding and transport protein. Molecular chaperons in folding, Protein sorting and trafficking using signal proteins,	15
	III	RNA interferences and epigenetics DNA rearrangement ,RNAi, regulation of translation, RNA interference, Gene silencing, Epigenetic inheritance and Retrotransposons Omic studies	15
	IV	Omes and Omics, concepts and applications, genome overview at the level of chromosomes(with model organisms as example), strategies for large scale DNA sequencing. EST and STS, Whole Genome Analysis techniques. Next generation sequencing methods, organization, structure, and mapping of genomes (with model organisms as example Introduction to proteomics, transcriptomics, metabolomics. Whole exome analysis	15

References:

1. GenesXI,11thedition(2012),BenjaminLewin,Publisher-JonesandBarlettInc. USA
2. Molecular Biology of the Gene, 6th Edition (2008), James D. Watson, Pearson Education, Inc. and Dorling Kindersley Publishing, Inc.USA
3. Molecular Biology, 5th Edition (2011), Weaver R., McGrawHill Science.USA
4. FundamentalsofMolecularBiology,(2009),PalJ.K.andSarojGhaskadbi,Oxford University Press .India
5. Molecular Biology: genes to proteins, 4th edition (2011), Burton E Tropp Jones & Bartlett Learning, USA
6. Discovering genomics, Proteomics and Bioinformatics (2006) A. Malcolm

Campbell, Laurie J. Heyer Benjamin Cummings; 2nd edition

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Course Code: RPSBTKP103

Course Title: Practicals based on RPSBTK103

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTKP103	1. Extraction of genomic DNA from bacteria and blood 2. Perform transformation of bacteria. 3. Expression of recombinant protein. 4. Purification of DNA from agarose gel. 5. Detection of changes in the conformation of BSA by Viscosity measurement. 6. Demonstration of Conjugation. 7. Induction of Galactosidase in <i>E. coli</i> (and effect of inducers).	2

(Microbiology, Biotechnology, Biochemistry)

Course Code : RPSBTK104

Semester I

Course Title: Clinical Data Management

Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	
CO 1	Discuss the ethical issues in human subjects research
CO 2	Imagine and understand the different phases of clinical trials
CO 3	Analyze the roles and responsibilities of the investigator and the institution
CO 4	Examine various regulatory issues related to clinical studies
CO 5	Recall the companies and organizations associated in this field
CO 6	Develop interest on medical writing and design a clinical study report

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Credits/ Lectures
RPSBT K104	I	Drug discovery and Preclinical toxicology Pre-Clinical toxicology: General Principals, Systemic toxicology, (Single dose and repeat doset oxicity studies), Carcinogenicity, Mutagenicity, Tera togenicity, Reproductive toxicity, Local toxicity, Genotoxicity, animal toxicity requirements	15
	II	Introduction to Clinical trials Introduction to clinical trials, Historical guidelines in clinical research (Nuremberg code, Declaration of Helsinki and Belmonte report), ICH-GCP guidelines (E6-R1), Phases of clinical trials.	15
	III	Clinical study design Clinical study methodology and regulations: Principles, types (single blinding, double blinding, open access, randomized trials and their examples), Design of protocol, CRF, e-CRF, IB, ICF and preparation of trial reports, Regulations involved (ICMR guidelines) and ethics.	15
	IV	Medical Writing Medical Writing: Literature search and medical articles, contract writing, publication, abstracts, bibliography clinical study reports, principles and software's in CDM	15

References:

1. EC R1 guidelines.
2. ICMR ethical guidelines.
3. D & C Rules – Schedule Y.
4. Law Of Intellectual Property Rights Shiv Sahai Singh Deep & Deep Publications (p) Ltd.
5. WTO And Intellectual Property Rights By Talwar Sabanna (2007) Serials Publications.
- 6 IPR: Unleashing the Knowledge Economy(2003) Prabuddha Ganguli Tata Mcgraw Hill publication.

Course Code: RPSBTKP104

Course Title: Practicals based on Clinical Data
Management

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTKP104	<p>1. Action query based on various scenarios: vendor data query, eCRF data query, date Mis-Match query in ERCF on AE form and study conclusion form.</p> <p>2. Design and Raise a query as per given scenario: data missing query, out of sequence data on AE/ CONMED (Adverse Event/ concomitant medication log) form missing labs query on visits already performed etc.</p> <p>3. Designing eCRF form based on given protocol (only particular sections of protocol will be given)</p> <p>4. Designing of eCRF completion guidelines based on given protocol.</p> <p>5. Perform Screening process of various drug molecules from plant, algal and marine sources before performing preclinical toxicity study.</p> <p>6. Perform preclinical toxicity study on cell lines and microorganisms using drugs screened in exp no.5</p> <p>7. Various ways to resolve vendor issues.</p>	2

Modality of Assessment:
RPSBTK104 (Discipline
Specific course)

Theory Examination Pattern

A. Internal assessment -40%-40 Marks

Sr. No	Evaluation Type	Marks
1	One Assignment /case study/project based/Written assignment/Presentations	20
2	One class test (Multiple choice questions)	20

B. External Examination- 60%-60 Marks

Semester End Theory Examination:

1. Duration: These examination shall be of 2.5 hrs

2. Theory question paper pattern

- There shall be 4 questions each of 15 Marks. On each unit there will be one question
- All questions shall be compulsory with internal choice within the questions

Paper Pattern:

Questions Pattern	Marks	Question based on
Q.1 A)	Any 1 out of 2	8
Q.1 B)	compulsory	7
Q.2 A)	Any 1 out of 2	7
Q.2 B)	compulsory	8
Q.3 A)	Any 1 out of 2	8
Q.3 B)	compulsory	7
Q.4 A)	Any 1 out of 2	7
Q.4 B)	compulsory	8
	TOTAL	60M

Practical Examination Pattern:

- A. External Examination- 50 Marks
Semester End Practical Examination

Particulars	Paper
Laboratory Work	40
Journal	05
Viva	05
Total	50

Ramnarain Ruia Autonomous College

Course Code: RPSMICP104

Course Title: Clinical Microbiology and Epidemiology

Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Understand the layout, workflow and documentation in a Clinical Microbiology laboratory
CO 2	Understand different classical and modern processes in a Clinical Microbiology laboratory and their significance
CO 3	Comprehend the threat of Antimicrobial resistance
CO 4	Apply appropriate methodologies to tackle the threat of antibiotic resistance
CO 5	Perform and analyse all kinds of clinical microbiological tests associated with antibiotic susceptibility testing Demonstrate a basic understanding of epidemiological strategies,
CO 6	study designs and evaluate the data for its statistical relevance. Discuss and understand the strategies to detect & monitor biological
CO 7	agents used for bioterrorism & exemplify the significance of biosecurity. Understand the significance of health care associated infections,
CO8	molecular and genetic epidemiology and apply it Become aware and get sensitized to the ethics of epidemiological
CO 9	studies involving human participants

Course Code: Discipline Specific Elective -I

Course Title: Clinical Microbiology and Epidemiology

Academic year 2022-23

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Credits/ Lectures
RPSMIC 104		CLINICAL MICROBIOLOGY AND EPIDEMIOLOGY	04/60
I		Clinical Microbiology- General principles	15
	1.1	General Principles of Clinical Microbiology	5
		a. Laboratory Safety and Preventing the Spread of Disease b. Design of the Clinical Microbiology Laboratory c. Quality in the Clinical Microbiology Laboratory d. Legal and Ethical Issues	
	1.2	Clinical microbiology- Processes and Recent trends	10
		a. Phases of the diagnostic cycle b. Overview of Specimen Collection and Processing c. Specimen management and workup- Overview of classical and modern bacterial Identification Methods and Strategies d. Decontamination, Disinfection, and Sterilization during surgical procedures e. Automation and HTS in diagnosis f. Point of care diagnostics	
II		Clinical Microbiology- Antibiotic resistance and Antibiotic susceptibility testing	15
	2.1	Antibiotic resistance in microbes	07
		a. Antimicrobial resistance- General principles b. Mechanisms of antibiotic resistance in bacteria and fungi - overview c. Transfer of antibiotic resistance	

		<ul style="list-style-type: none"> d. Maintaining antibiotic resistance through Selective Pressure e. Methods for detection of resistance f. Antimicrobial stewardship, surveillance of antimicrobial consumption, and its consequences 	
	2.2	Antibiotic susceptibility testing	08
		<ul style="list-style-type: none"> a. General considerations- selection, Indications, b. Pharmacokinetic and pharmacodynamics Principles, Clinical relevance of antibiotic sensitivity tests, Serum killing curves Susceptibility Test Methods: Dilution and Disk Diffusion Methods- standardization, QC, Procedures and interpretation <ul style="list-style-type: none"> d. Antimicrobial Susceptibility Testing Systems e. Special methods- Bactericidal tests, Testing antibiotic combinations 	
III		Epidemiology I	15
	3.1	Introduction to Epidemiology	07
		<ul style="list-style-type: none"> a. Historical aspects-definition b. Descriptive Epidemiology-aims and uses c. Recent Applications of Epidemiology d. Introduction e. Observational Versus Experimental approaches in Epidemiology f. Overview of study designs used in Epidemiology g. Ecologic Studies h. Cross-Sectional studies i. Case-Control studies 	
	3.2	Public health surveillance	04
		<ul style="list-style-type: none"> a. b. c. Purpose and characteristics Bioterrorism <ul style="list-style-type: none"> Identifying health problems for surveillance Collecting data for surveillance Analyzing and interpreting data Disseminating data and interpretation Evaluating and improving surveillance 	
	3.3		03
		<ul style="list-style-type: none"> a. Introduction b. Threat Agents by category c. Sentinel Laboratory response to bioterrorism d. The Potential for Misuse of Biotechnology 	

		e. Some examples of biological agents as warfare – Bacillus anthracis, Yersinia pestis	
	3.4	Biosecurity	01
		a. Introduction b. Constituents of a Biosecurity hazard	
II		EPIDEMIOLOGY II	15
	2.1	Healthcare-associated infections	04
		a. Surveillance for HAIs b. Major types of HAIs c. The need for integrated infection control programs	
	2.2	Molecular and Genetic Epidemiology	07
		a. Definition – Molecular v/s Genetic epidemiology b. Epidemiologic evidence of genetic factors c. Causes of Familial Aggregation d. Gene Mapping: Segregation and Linkage analysis e. Genome Wide Association Studies (GWAS) Applications of genes in Epidemiologic designs	
	2.3	Ethics in Research involving Human Participants	03
		a. Introduction b. Historical perspective c. International Ethical and Research Practice guidelines d. Contemporary examples e. The informed Consent process	
	2.4	Epidemiology as a Profession	01

REFERENCES:

- a. b. Patricia M. Tille, Bailey and Scott's Diagnostic Microbiology, 13th ed, 2014, Mosby Inc
 c. and Dawey et al., Antimicrobial Chemotherapy, 7th ed. 2014, Oxford Univ Press
 2 d. e. Ed by Jorgensen et al., Manual of Clinical Microbiology, 11th ed., 2015, ASM Press Volume 1
 Lieseke, Zeibig, Essentials of Medical Laboratory Practice, 2012, F.A. davis Co.
 Brenda Wilson, Abigail Salyers et al, "Bacterial Pathogenesis- A molecular approach", 3rd ed, ASM press, 2011
 f. J. Vandepitte, J. Verhaegen et al, "Basic laboratory procedures in clinical bacteriology", 2nd ed, WHO, Geneva, 2003
 g. Gary Procop, Elmer Koneman et al, "Koneman's Color Atlas and Textbook of Diagnostic Microbiology", 7th Edition, Wolters Kluwer, 2017
 h. Principles of epidemiology in public health practices 3rd Ed.
 (www.cdc.gov/training/products/ss1000)

- i. Ann Aschengrau, George R Seage, Essentials of Epidemiology in Public Health, 3rd Ed.
- i. Robert H. Friis and Thomas A. Sellers, Epidemiology for Public Health Practice, Jones & Bartlett Learning, LLC, 5th ed.
- j. Kenrad E. Nelson, Infectious Disease Epidemiology – Theory and Practice, 3rd ed.

Course Code: RPSMICP104

Course Title: Practicals based on Clinical Microbiology and
Epidemiology

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credit s
RPSMICP104	<ul style="list-style-type: none"> a. QC of laboratory media b. QC of laboratory reagents c. Use of chromogenic media for detection of antibiotic resistant bacteria d. Detection of Beta lactamase producing <i>S.aureus</i> using nitrocefin disc's e. Antimicrobial susceptibility testing- disc method according to CLSI guidelines f. QA of Antibiotic Susceptibility Test- disc method g. Antibiotic Susceptibility Test – microdilution methods according to CLSI guidelines h. Checkerboard assay i. j. E-test k. Octa-disc method for AST l. Case Studies of epidemiological strategies m. Data analysis of epidemiological surveys Group project on collecting data for surveillance 	2

Modality of Assessment:
RPSMIC104 (Discipline
Specific course)
Clinical Microbiology and Epidemiology

I) Theory Examination Pattern:**A) Internal Assessment- 40%- 40 Marks**

Sr No	Evaluation type	Marks
	One Review writing/ Review paper presentation/Research paper presentation and Assignment / Long Answer/ Case Study or any other	20
2	Class test	20
	Total	40

B) External Examination- 60%- 60 Marks per paper

1. Duration- These examinations shall be of two hours and thirty minutes.

2. Theory question paper pattern-

a. There shall be five questions each of 12 marks. On each unit there shall be one question and the fifth question will be based on all the three units.

b. All questions shall be compulsory with internal choice within the questions.

Paper pattern:

Question	Options	Marks	Questions based on
Q.1)	Any 2 out of 3	12	Unit 1
Q.2)	Any 2 out of 3	12	Unit 2
Q.3)	Any 2 out of 3	12	Unit 3
Q.4)	Any 2 out of 3	12	Unit 4
Q.5) a)	Any 4 out of 5	04	All four units
Q.5) b)	Any 4 out of 5	04	All four units
Q.5) c)	Any 2 out of 3	04	All four units

II) Practical Examination Pattern

	DSE 1
Viva	-
Quiz	25
Laboratory work	25
Total	50

Journal

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Course Code: RPSBCH104

Course Title: Plant Biochemistry

Academic year 2022–23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Study the structural details of the plant cell
CO 2	Illustrate the chemistry of different plant pigments in order to explore their isolation, characterization and applications in various fields
CO 3	Explain and understand the biochemistry of photosynthetic process and its relation to man and its environment.
CO 4	Understand the mechanism of Nitrogen fixation and its importance in agricultural production and environment
CO 5	Acquire knowledge about the importance of secondary metabolites and its industrial applications.
CO 6	Identify the class and functions of secondary metabolites and appreciate their role in physiology of plants
CO 7	Know the significance of plant growth regulators in the development of plants
CO8	Understand the basics of plant tissue culture as it is an important tool for both basic and applied aspects of plant-based research
CO9	Become competent to explain relation between Photosynthesis, growth hormones and Plant growth
CO10	Develop skills and knowledge to conduct basic research work in the field of Plant Biochemistry

DETAILED SYLLABUS

Course Code/ Unit	Unit	Course/ Unit Title Plant Biochemistry	Lectures Credits ⁴
RPSBCH104	1	Overview of Plant cell structure, plant pigments & plant metabolism	15L
	1.1	Plant cell wall (structure), Overview of Leaf structure – Upper epidermis, palisade mesophyll, spongy mesophyll, lower epidermis, Guard cells and stomata	3L
	1.2.1	Specialized plant cells (in brief) – Parenchyma, Sclerenchyma, Collenchyma, Xylem and phloem, Bulliform cells	2L
	1.2.2	Concept of apoplast, apoplastic and symplastic pathways Plant pigments –	1L
	1.2		3L
	1.2.1	Primary pigment - Chlorophyll (Types and function)	
	1.2.2	Role of accessory pigments and their biological significance Carotenoids, Xanthophylls, Betalains, Anthocyanins and other flavonoids	
	1.3	Plant Micronutrients	1L
	1.4	Nitrogen metabolism	5L
	1.4.1	Sources of Nitrogen, different forms of nitrogen in plants	
	1.4.2	Conversion of nitrate to nitrite & finally to ammonia, biological nitrogen fixation in plants	
	1.4.3	Sulphur metabolism, Phosphorous metabolism	
	2	Photosynthesis, Photorespiration and plant movements	15L
	2.1	Photosynthesis	3L

	2.2	Light reactions: Light harvesting complexes, Absorption of light, Photophosphorylation: Cyclic and Non-cyclic (Z scheme)	
	2.2.1	Dark reactions: Calvin cycle, regulation of Calvin cycle C4 cycle and CAM pathway Synthesis of glucose, starch, sucrose	5L
	2.2.2	Photorespiration, Photoperiodism and photoinhibition	4L
		Physiology of plant movements Physical movements – Xerochasy, Hydrochasy Vital movements – Protoplasmic streaming, paratonic movements Tactic movements – Chemotaxis, Phototaxis, Thermotaxis Tropic movements – Chemo / geo / hydro / photo / thigmo tropism Nastic movements – Seismonasty, Nyctynasty, Photonasty, Chemonasty, Thermonasty	3L
	3	Regulation of plant growth, secondary metabolites and Sexual reproduction in plants	15L
	3.1	Plant Growth Substances Structure and Function of - Auxins, Gibberellins, Cytokinins, Ethylene and Abscisic Acid	2L
	3.2	Secondary metabolites of plants Nitrogen containing compounds (Alkaloids), Terpenes & Phenolic compounds – Shikimic acid pathway, Mevalonic acid pathway, MEP Pathway Reproduction in plants and PTC	4L
	3.3	Asexual reproduction in gymnosperms.	7L
	3.3.1	Life Cycle of Gymnosperms.	

	3.3.2	Sexual Reproduction in angiosperms: Structure of plant gametes. Life cycle of angiosperm	
		Double fertilization in plants	
	3.3.3	Post fertilization events in plants	
	3.4	Plant Tissue Culture Principles & techniques of PTC	2L
	4	Phytoremediation	15L
	4.1	Concept of Phytoremediation Process and mechanism contaminant removal, General contaminants of air, water and soil	4L
	4.2	Mechanisms of Phytoremediation	5L
	4.2.1	Phytoextraction, phytostabilization, phytotransformation, phytostimulation, phytovolatalization and Rhizofiltration	
	4.2.2	Enzymes involved in phytoremediation	
	4.3	Control of environmental pollution by Phytoremediation. Criteria for selection of plants	6L

References:

1. Biochemistry & Molecular Biology of Plants - Bob B. Buchanan - Wilhelm Gruissem and Russel L. Jones .
2. Plant Biochemistry - Heldt H.-W., Piechulla B.
3. Methods in plant biochemistry and molecular biology - Dashek, William V
4. Plant Secondary Metabolites: Occurrence, Structure and Role in the Human Diet - Alan Crozier
5. Plant Physiology - Taiz and Zeiger - Sinauer Associates Inc.
6. Plant Biochemistry - Caroline Bowsher, Martin steer, Alyson Tobin - Garland science
7. Plant Biochemistry - P.M Dey and J.B. Harborne - Academic Press 8.
Biochemical methods - S Sadashivam and A Manickam - New Age International publishers

Course Code: RPSBCHP104

Course Title: Practicals based on Plant biochemistry

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBCHP104	<ol style="list-style-type: none">1. Study of medicinal plants for human health and their health benefits2. Extraction of essential oils from plants3. Phytochemical analysis – Qualitative test Quantitative estimation of Total Phenolic content4. Study of effect of Eutrophication on water quality5. Preparation of growth media using plant waste6. Total carbohydrate content by Anthrone method7. Estimation of Vitamin C Content in plant by dye method.8. Effect of phytohormones on plant growth.	2

Modality of Assessment

RPSBCH104 (Discipline Specific course)

Plant Biochemistry

Theory Examination Pattern:

A. Internal Assessment- 40%- 40 Marks

B. External Examination- 60%- 60 Marks

Semester End Theory Examination: (Deviation from the usual modality) Owing to the pandemic situation prevailing in 2020 and continuing in 2021, the external examinations (Semester End) may be conducted online as per the instructions/circulars received from the University of Mumbai and Maharashtra State notifications from time to time. The conventional mode of external examination will commence again only after the declaration of normalcy by the Government authorities.

1. Duration - These examinations shall be of 2. Theory question paper pattern:

02 ½ HOURS duration.

Paper Pattern:

Questions	Pattern	Marks	Question based on
Q.1 A)	Any 1 out of 2	8	Unit I
Q.1 B)	compulsory	7	
Q.2 A)	Any 1 out of 2	8	Unit II
Q.2 B)	compulsory	7	
Q.3 A)	Any 1 out of 2	8	Unit III
Q.3 B)	compulsory	7	
Q.4 A)	Any 1 out of 2	8	Unit IV
Q.4 B)	compulsory	7	

	TOTAL	60M	
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Practical Examination Pattern:**A. Internal Examination: 40%– 40 Marks**

Particulars	Practical I, II, III & IV
Journal	05
Experimental tasks	15
Total	20

B. External Examination: 60%– 60 Marks**Semester End Practical Examination:**

Particulars	Practical I, II, III & IV
Laboratory work	25
Viva	5
Total	30

Course Code: RPSBTK105

Semester I

Course Title: Emotional well-being through Logic-based thinking

(30 Hours – 2 Credits Course)

Course Description: Much of human existence is engulfed in the emotions of anger, depression, worry, anxiety, guilt, and frustration. From dealing with issues arising in the classroom to the workplace, and the arena of social interaction, intimacy, and friendship, the prospect for happiness is often spoiled by irrational thinking possessed by the human mind. Skills like being able to manage one's emotions and thoughts are important to every student irrespective of their academic areas of interest. This course helps students to use the methodologies in philosophy to work upon these irrational thinking tendencies thereby achieving a healthier state of mind. It focuses on a prominent form of philosophical practice known as Logic-Based Therapy and Consulting (LBT) developed by American philosopher Elliot D Cohen. Upon successful completion of this course, the student will be equipped with the knowledge of overcoming their faulty thinking patterns, ways of refuting them, and skills to replace them with rational patterns. In effect, the students will be able to manage their emotions in a better way by working on their thinking process.

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	
CO 1	Understand the connection between thinking patterns, emotions, and behavior.
CO 2	Identify one's faulty thinking patterns (fallacies) and methods for refuting them.
CO 3	Replace faulty thinking patterns with positive and rational thinking patterns. Using philosophical antidotes to promote a healthy state of mind.
CO 4	

Detailed Syllabus

Unit 1	Relation between Emotions and Thinking	15. Hrs)
	a. Fundamentals of emotional well-being. b. Tracing the thoughts behind an emotional problem. c. Some prominent faulty thinking patterns/fallacies causing harm to oneself and others: <ul style="list-style-type: none"> • Demanding perfection • World Revolves Around Me • Damnation • Awfulizing • Can'tstipation. 	
Unit 2	Strengthening rational thinking patterns	
	a. How to refute the fallacies <ul style="list-style-type: none"> • Fallacy-Antidotes-Virtues framework b. Some uplifting Antidotal reasoning to overcome the fallacies c. Corresponding Guiding virtues for the fallacies: <ul style="list-style-type: none"> • Demanding perfection- Metaphysical security • World Revolves Around Me- Empathy • Damnation- Respect • Awfulizing- Courage • Can'tstipation- Temperance. 	(15 Hrs)

References:-

Elliot D Cohen, *What Would Aristotle Do: Self-Control through the Power of Reason*, Prometheus Books, 2003.

Modality of Assessment

Semester I

Theory Examination Pattern

B. Internal assessment -40%-40 Marks

Sr. No	Evaluation Type	Marks
1	One Assignment /case study/project based/Written assignment/Presentations	20
2	One class test (Multiple choice questions)	20

C. External Examination- 60%-60 Marks

Semester End Theory Examination:

3. Duration: These examination shall be of 2.5 hrs

4. Theory question paper pattern

- There shall be 4 questions each of 15 Marks. On each unit there will be one question
- All questions shall be compulsory with internal choice within the questions

Paper Pattern:

Questions Pattern	Marks	Question based on	
Q.1 A)	Any 1 out of 2	8	Unit I
Q.1 B)	compulsory		
Q.2 A)	Any 1 out of 2	7	Unit II
Q.2 B)	compulsory		
Q.3 A)	Any 1 out of 2	8	Unit III
Q.3 B)	compulsory		
Q.4 A)	Any 1 out of 2	7	Unit IV
Q.4 B)	compulsory		
	TOTAL	60M	

Practical Examination Pattern:

- B. External Examination- 50 Marks
Semester End Practical Examination

Particulars	Paper
Laboratory Work	40
Journal	05
Viva	05
Total	50

Modality of Assessment

Semester I

AECC-1

Assessment methods:

Semester End Theory Examination	• 50 Marks
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Overall Examination and Marks distribution Pattern

Semester I

Course	CC/DSE		AECC	total
	RPSBTK101/102/103/DSE			
	Internal	External	External	
Theory	40	60	50	450
Practicals		50	-	200

SEMESTER II

Course Code: RPSBTK201

Course Title: Metabolism

Core Course-3

Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Comment on the biosynthesis of various types of fatty acids and its significance and regulation.
CO 2	Explain the importance and levels of regulation of acid-base balance in body, their disorders and treatments
CO 3	Comprehend the various stress experienced by plants and their consequences on growth and metabolism
CO 4	Interpret the role played by secondary metabolites in plant defence system
CO 5	Differentiate between the various carbon fixation cycles in plants and interaction of microbes with the environment.
CO 6	Elucidate the molecular structure and role of nitrogenase in the nitrogen cycle and importance of ammanox reactions in nature.

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Lecture s
RPSBTK201	I	Lipid Metabolism Lipid metabolism: Biosynthesis of fatty acids (saturated, monounsaturated ,polyunsaturated), triglycerides and phospholipids.FAS Complex, regulation of fatty acid metabolism. Biosynthesis and regulation of cholesterol, prostaglandins, membrane lipids.	15
	II	Physiological biochemistry Regulation of acid-base balance, types and	15

		functions of acid-base buffers, respiratory mechanism of acid-base balance, renal control of acid base balance, clinical abnormalities associated with acid base imbalance. Water and electrolyte balance, clinical abnormalities. Kidney Diseases and diuretics: Acute renal failure, chronic renal failure, specific tubular disorders, treatment of renal failure.	
	III	Stress Metabolism in plants Environmental stresses, salinity, water, stress, heat, chilling, anaerobiosis and heavy metals and their impact on plant growth and metabolism, criteria of stress tolerance. Secondary metabolites in plants- Nature, distribution and their role in plant protection. Steroid biotransformation	15
	IV	Plant and microbial metabolism Hatch slack pathway, Crassulacean acid metabolism, photorespiration and glyoxylate pathway with significance. Photosynthetic formation of hydrogen. Nitrogen fixation and role of nitrogenase, anammox reactions. Plant symbiosis with fungi: Arbuscular, mycorrhiza, Ectomycorrhiza	15

References:

1. Biochemistry, L Stryer, Freeman and Co, NY
2. Biochemistry, Zubay, Addison Wesley and Co.
3. Textbook of Physiology, Guyton
4. Principles of Biochemistry, Lehninger, 5th edition, Cox and Nelson, W.H. Freeman and Company, NY.
5. Physiology- Berne and Levy
6. Harper's Biochemistry- 27th edition
7. Text book of Human Biochemistry- Ed. G. P. Talwar
8. Essentials of food and nutrition M Swaminathan Vol. II, Applied aspects (1974), Ganesh Pub, Madras
9. Human biochemistry – James Orten and Otto Neuhaus, 10th ed , CV Mosbyco
London

Course Code: RPSBTKP201

Course Title: Practicals based on RPSBTK201

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTKP201	<ol style="list-style-type: none">1. Estimation of Niacin by the CNBr method2. Isolation of cholesterol and lecithin from egg yolks3. Detection of Flavonoids in Plants.4. Estimation of leghemoglobin.5. Proline estimation in germinated seeds with and without stress6. Estimation of phospholipids.7. Assay of superoxide dismutase in salt stressed and Normal plant.8. Estimation of Ca⁺⁺ / Zn⁺⁺ by EDTA titrimetric method	2

Course Code:RPSBTK202
Course Title: Immunology
Core Course-5
Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Differentiate between different intricate aspects of various Immunological diseases.
CO 2	Comment on various factors involved in hypersensitivity reactions and their emphasis on treatment
CO 3	Discuss the making and role of different types of vaccines
CO 4	Demonstrate the principle techniques and applications involved in <i>invitro and in vivo</i> imaging
CO 5	Interpret how the psychology affect the immunological aspects of human body.
CO 6	Enumerate the implications of various disorders associated with dysregulation of pschyco neuroimmunology.

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Lecture s
RPSBTK202	I	Immunological diseases Autoimmunity mechanisms, Altered antigens, Systemic Lupus erythematosus, Graves diseases, Rheumatoid arthritis, Myasthenia Gravis, Multiple sclerosis, animal models of autoimmunity, GvH, Immunodeficiency (Primary & secondary): phagocytic, humoral, CMI, combined HLA association with disease.	15
	II	Hypersensitivity and Transplantation Types of hypersensitivity reactions, Mechanism,	15

		Factors involved and their treatment, Immunology of transplantation. purified macromolecules as vaccine, Recombinant vector Vaccine, DNA Vaccines ,multivalent Subunit Vaccines	
	III	CMI and imaging Cell Cytotoxicity, mixed lymphocyte reaction, Apoptosis, Cell cloning, Reporter Assays, Peptibodies- production and application; Cell imaging Techniques- <i>In vitro</i> and <i>In vivo</i> ; Immuno-electron microscopy; <i>In vivo</i> cell tracking techniques; Application based microarray, Phage display	15
	IV	Psychoneuro- immunology Connections of CNS to immune system and vice versa. Psychological modulation of immunity, stress and immunity, implication for diseases, functional significance - inflammation and acute phase response, role of glucocorticoids, stress response, energy demand and balance, Introduction and History of Neuroendocrine circuitry, disorder of Thoughts and volition – Schizophrenia, Addition of Action of Drug.	15

References:

1. Immunology 5th edition JanisKuby
2. Fundamental Immunology 5th edition (August 2003): by William E., Md.Paul (Editor) By Lippincott Williams & WilkinsPublishers
3. Essential Immunology, Ivan M. Roitt (1994)– Blackwell ScientificPub,Oxford.
4. Cellular and Molecular Immunology, 3rd edition,Abbas
5. Psychoneuroimmunology, Stress, and Infection, By HermanFriedman,Thomas W. Klein, Andrea L. Friedman, CRC Press, 1996

Course Code: RPSBTKP202

Course Title: Practicals based on RPSBTK202
 DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTKP202	1. <i>In-vitro</i> demonstration of phagocytosis and calculating phagocytic index. 2. Latex bead agglutination / precipitation test for detection of rheumatoid factor (RF) . 3. Assay for plaque forming cells. (Video DEMO) 4. Raising antibodies in laboratory animals (Video DEMO) 5. Cell-imaging Techniques <i>In vitro</i> and <i>In vivo</i> ; Immuno-electron microscopy; <i>In vivo</i> cell tracking techniques; Microarrays. 6. Demonstration of radioimmunoassay	2

Course Code: RPSBTK203
Course Title: Bioinstrumentation
Core Course-6
Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Summarize advanced and state of the art techniques with various types of electron microscopy.
CO 2	Compare different types of PCR and their applications.
CO 3	Enumerate different types of advanced molecular cloning methodology.
CO 4	Discuss on the variety of spectroscopic techniques with respect to molecular analysis
CO 5	Develop skills in handling and performing different chromatographic techniques.
CO 6	Analyze different aspects of immunological and histochemical techniques.

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Lectures
RPSBTK203	I	Advanced microscopic and PCR techniques Details of Scanning tunnelling microscopy and Scanning probe microscopy, atomic force microscopy, fluorescent microscopy, sample preparation and working for electron microscopy. types of PCR: Multiplex PCR, Nested PCR, RT – PCR, Real time-PCR ,Gibson assembly, golden gate, CPEC, CRISPR CAS system	15

	II	Spectroscopy Introduction, principle and analysis using fluorescence spectroscopy, circular dichroism, ORD, NMR and ESR spectroscopy, Molecular structure determination Using X-ray diffraction, X-ray crystallography and NMR, Molecular Analysis using light scattering, mass spectrometry and LCMS, GC-MS and surface plasma resonance methods, IR.	15
	III	Chromatography Introduction, principle and analysis using HPTLC, HPLC, GLC, Affinity chromatography and its types. Column details and theoretical plates, applications. IEF and 2D electrophoresis. Applications of the Above techniques.	15
	IV	Histochemical and Immunotechniques Antibody generation, blotting techniques, Immuno-precipitation, Flow cytometry and Immune fluorescence, detection of antigens in living cells, <i>in situ</i> localization by techniques such as FISH and GISH, Microarray	15

References:

1. Principles and Techniques of Biochemistry and Molecular Biology, 7th edition Wilson K.M., Walker J.M., Cambridge University Press, UK (2010),
2. Biochemical spectroscopy. Vol 46 of Methods in Enzymology. (1995) Kenneth Sauer. Academic Press, USA
3. Modern experimental biochemistry 3rd edition Publisher, USA. edition. (2000) Rodney Boyer. Prentice Hall
4. Analytical Biochemistry, 3 edition, (1998), David Holmes, H. Peck, Prentice Hall, UK.

Course Code: RPSBTKP203

Course Title: Practicals based on RPSBTK203

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTK203	<ol style="list-style-type: none">1, Use of UV spectrophotometry to determine the concentration of protein2. Separation of sugars in coconut water using TLC3. Determination of enzyme activity by Zymogram.4. Affinity chromatography for purification of immunoglobulins.5. Standardization /optimization of PC6. Demonstration Of HPLC/NM	2

Microbiology, Biotechnology, Biochemistry)

Course Code: RPSBTK204

Semester II

Course Title: Nanotechnology

Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Discuss the basics of nanotechnology, tools used for characterizing nanomaterials and specific applications of nanotechnology.
CO 2	Examine the nanorobotics devices of nature.
CO 3	Analyze and interpret the latest developments in nanotechnology in the field of medical sciences. Explain drug delivery systems using nanotechnology.
CO 4	Apply nanomaterials in food, cosmetics, agriculture, and environment
CO 5	management. Assess and appreciate the thrust in the domain and encourage it to
CO 6	take ahead in research.

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Credits/ Lectures
RPSBT K204	I	Introduction to nanotechnology - principles and applications Introduction, synthesis of nanomaterials, biological methods, use of microbial systems & plant extracts, use of proteins & templates like DNA, Characterization of nanomaterials, analysis techniques, properties of nano mechanical, optical, magnetic properties, electrical conductivity, thermal conductivity.	15
	II	Carbon nanotubes, Nanorobotics devices of nature: ATP synthase, the kinen, myosin, dynein, flagella modulated motion.	15
	III	Nanomedicine Nanomedicine : biopharmaceuticals ,implantable materials, implantable chemicals, surgicals aids ,diagnostic tools ,Nano sensors and nano scanning, nano enabled drug delivery system, nanorobotics in medicine.	15
	IV	Applications of nanotechnology Application of nanomaterials in food, cosmetics, agriculture, environment management.	15

References:

1. The Nano scope encyclopedia of nanoscience and nanotechnology, VolI, VandVI (2005) Dr.Parag Diwan and Ashish Bhardwaj Pentagon Press New Delhi.
2. Nano forms of carbon and its applications (2007) Prof .Maheshwar Sharon and Dr.Madhuri Sharon Manad Nanotech Pvt.Ltd.
3. Biotech Nanotechnology lessons from Nature (2004) David Goodsell Wiley-Liss A John Wiley and sons.
4. Nanotechnology- Basic science and emerging technologies (2005) Willson Kannangava, Smith, Simmons, Raguse Overseas Press.
5. Textbook of Biotechnology (2005) R. C. Dubey S. Chand and Co.
6. Nanotechnology- Principles and practices S. K. Kulkarni Capital Publishing Co.

Course Code: RPSBTKP204

Course Title: Practicals based on Nanotechnology

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBTKP204	<ol style="list-style-type: none">1. Antibacterial studies of silver nanoparticles by MIC method.2. Testing the cell viability of metal oxide nanoparticles using tissue culture technique.3. Synthesis of Metal Nanoparticles by Chemical reduction method and their UV-VIS absorption studies.4. Synthesis of nanoparticles using bacterial systems and their UV-VIS absorption studies.5. Synthesis of nanoparticles using plant extract and their UV-VIS absorption studies.6. Synthesis of nanoparticles using fungal system and their UV-VIS absorption studies.7. Analysis of nanoparticles using UV vis spectrophotometer, TEM ,SEM -data interpretation.	2

Modality of Assessment:
 RPSBTK204 (Discipline
 Specific course)
 Nanotechnology

Theory Examination Pattern

C. Internal assessment -40%-40 Marks

Sr. No	Evaluation Type	Marks
1	One Assignment /case study/project based/Written assignment/Presentations	20
2	One class test (Multiple choice questions)	20

D. External Examination- 60%-60 Marks

Semester End Theory Examination:

5. Duration: These examination shall be of 2.5 hrs

6. Theory question paper pattern

- There shall be 4 questions each of 15 Marks. On each unit there will be one question
- All questions shall be compulsory with internal choice within the questions

Paper Pattern:

Questions Pattern	Marks	Question based on
Q.1 A)	Any 1 out of 2	8
Q.1 B)	compulsory	
Q.2 A)	Any 1 out of 2	7
Q.2 B)	compulsory	
Q.3 A)	Any 1 out of 2	8
Q.3 B)	compulsory	
Q.4 A)	Any 1 out of 2	7
Q.4 B)	compulsory	
	TOTAL	60M

Practical Examination Pattern:

- C. External Examination- 50 Marks
Semester End Practical Examination

Particulars	Paper
Laboratory Work	40
Journal	05
Viva	05
Total	50

Ramnarain Ruia Autonomous College

Course Code: RPSMIC204

Course Title: Microbial Approaches to Quality Management

Academic year 2022-23

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Execute collection, processing and microbiological analysis of food, water, pharmaceutical and cosmetic samples
CO 2	Implement monitoring protocols for the quality of food and water using principles of HACCP
CO 3	Apply basic knowledge of microbial analysis and standards to evaluate current techniques and improvise technology in industries like food, bottled water, cosmetic and pharmaceutical manufacturing units
CO 4	Recall the principles and terminologies used in pharmaceutical industry
CO 5	Design experiments on bioburden determination
CO 6	Execute microbial and sterility testing of pharmaceutical products
CO 7	Monitor the factors which affect the quality of a pharmaceutical product
CO 8	Outline the process of validation and audit validation
CO 9	Design effective antimicrobial preservation methods for cosmetic products

DETAILED SYLLABUS

Course Code	Unit	Course/ Unit Title	Credits/ Lectures
RPSM IC204		MICROBIAL APPROACHES TO QUALITY MANAGEMENT	04/60
		Introduction to Quality Control and Quality Assurance	15
	1.1	Basics of Quality and Audits a. Introduction to Basics of Quality b. Total Quality Management c. Quality Assurance d. Audits e. Manufacturing Audits: Control of Processing Operations	08
	1.2	Good Manufacturing Practices and HACCP a. Plant Sanitation: Good Manufacturing Practice Audits b. Hazard Analysis and Critical Control Points	07
II		Quality Control and Quality Assurance in Food and Water Industry	15
	2.1	Quality Assurance in Food Industry a. Food Safety Assurance and Standards b. Microbiological Examination Methods for food c. Role of International and National Organisations	09
	2.2	Quality Assurance in Water Industry a. General considerations and principles b. A conceptual framework for implementing the Guidelines c. Verification of drinking-water quality d. Drinking-water regulations and supporting policies and programmes	06
III		Quality Control and Quality Assurance in Pharmaceutical Industry	15
		A. Laboratory management and design B. Microbiological examination of nonsterile products C. Sterility Testing D. Antibiotic Potency Testing	
III		Quality Control and Quality Assurance in Pharmaceutical and Cosmetic Industry	15

	A.	Pyrogen Testing and Bioburden determination	8
	B.	Antimicrobial Effectiveness Testing and Preservation of Cosmetics	7
	a.	Preservative Effectiveness Testing	
	b.	Preservation of cosmetics	
	c.	Aspects of cosmetic preservation	

REFERENCES:

- a. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyer, Handbook of Microbiological Quality Control: Pharmaceuticals and Medical Devices Taylor and Francis
- b. Food And Drug Administration, Office Of Regulatory Affairs, Office of Regulatory Science, Document Number:ORA.007, Pharmaceutical Microbiology Manual, Revision #: 02 Revised: 25 Aug 2020
- c. Tim Sandle, "Pharmaceutical Microbiology- Essentials for Quality Assurance and Quality control", Woodhead Publishing, Elsevier, 2016
- d. Philip A, Taylor and Francis, "Cosmetic Microbiology a practical approach", 2nd Ed. 2006
- e. WHO drinking water guidelines, Manual For Packaged Drinking, Water Bureau Of Indian Standards, January 2005
- f. Food Safety Management Programs by Debby Newslow
- g. Microbiological Examination Methods for Food and Water by Neusely da Silva
- h. Food Safety Management A Practical Guide for the food Industry by Yasmine Motarjem
- i. Quality Assurance for Food Industry- A Practical Approach. 3rd Edition, J. Andres Vasconcellos

Course Code: RPSMICP204

Course Title: Practicals based on Microbial Approaches to Quality Management

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSMICP204	a. Sterility testing and reporting (as per Pharmacopeia) b. Preparation of cosmetic product and its stability study c. Microbial load in cosmetic product as per IS 14648:2011 w.r.t heterotrophic counts, presence of <i>Pseudomonas spp</i> , <i>Staphylococcus spp</i> , <i>P.acne</i> d. Efficacy testing of preservatives like parabens as per ISO 11930 e. Performance of an audit of a test with proper documentation f. Bioburden determination of manufacturing unit g. Determination of efficacy of sterilization methods. h. Demonstration of endotoxin/pyrogen testing i. Microbiological load in carrot and apple juice, salad, mayonnaise j. Quality Assessment and Analysis of Raw and Pasteurized milk k. To detect coliform and faecal coliform bacteria in water by the membrane filtration method l. Study of efficiency of water purifiers and comparative assessment m. MIC of food preservative n. Determination of Thermal Death Point (TDP) and Thermal Death Time (TDT) o. Potability testing of drinking Water. p. Film medium for detection of coliforms in water and food q. Dip slide technique for detection of organisms from food and water samples	2

Modality of Assessment:

RPSMIC204 (Discipline

Specific course)

Microbial Approaches to Quality Management

I) Theory Examination Pattern:

A) Internal Assessment- 40%- 40 Marks

Sr No	Evaluation type	Marks
1	One Review writing/ Review paper presentation/Research paper presentation and Assignment / Long Answer/ Case Study or any other Class test	20
2		20
	Total	40

B) External Examination- 60%- 60 Marks per paper

1. Duration- These examinations shall be of two hours and thirty minutes.

2. Theory question paper pattern-

a. There shall be five questions each of 12 marks. On each unit there shall be one question and the fifth question will be based on all the three units.

b. All questions shall be compulsory with internal choice within the questions.

Paper pattern:

Question	Options	Marks	Questions based on
Q.1)	Any 2 out of 3	12	Unit 1
Q.2)	Any 2 out of 3	12	Unit 2
Q.3)	Any 2 out of 3	12	Unit 3
Q.4)	Any 2 out of 3	12	Unit 4
Q.5) a)	Any 4 out of 5	04	All four units
Q.5) b)	Any 4 out of 5	04	All four units
Q.5) c)	Any 2 out of 3	04	All four units

II) Practical Examination Pattern

	DSE 1
Viva	-

Quiz	25
Laboratory work	25
Total	50

Journal

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination. In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head/ Co-ordinator / Incharge of the department; failing which the student will not be allowed to appear for the practical examination.

Course Code: RPSBCH204

Course Title: Nutraceutical and Functional
Foods

Academic year 2022-23

DETAILED SYLLABUS

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Understand the Basics of Nutraceuticals as Science
CO 2	Comprehend the Properties, structure and functions of various Nutraceuticals
CO 3	Demonstrate the use of Nutraceuticals as remedies
CO 4	Develop Novel Food and food Ingredients: Polysaccharides, low caloric sweeteners Illustrate the effect of Anti-nutritional factors and Limitations
CO 5	of Nutraceuticals & Functional foods

DETAILED SYLLABUS

Course Code/ Unit	Unit	Course/ Unit Title	Lectures
RPSBCH204		Nutraceutical and Functional Foods	
I	1	Nutraceutical Science	15L
	1.1	Introduction to Nutraceuticals as Science	1L
	1.2	Classification, scope & future prospects of the Nutraceutical Science	3L
	1.3	Sources of Nutraceuticals.	3L

		Plant sources, Animal sources, Microbial sources and Minerals	
	1.4	Applied aspects of the Nutraceutical Science. Relation of Nutraceutical Science with	1L
	1.5	other Sciences	4L
	1.5.1	Medicine, Human physiology, genetics, food technology, chemistry and nutrition.	
	1.6	Analysis of nutraceuticals- Techniques (Spectroscopic, Voltammetric, Chromatographic)	3L
II	2	Bioceuticals	15L
	2.1	Properties, structure and functions of various Nutraceuticals	3L
	2.1.1	Glucosamine, Octacosanol, Lycopene, Carnitine, Melatonin and Ornithine alpha ketoglutarate	
	2.1.2	Use of proanthocyanidins, grape products, flaxseed oil, minor millets as Nutraceuticals.	3L
	2.3	Development of Novel Food and food Ingredients:	6L
	2.3.1	Naturally produced flavour modifiers, Single Cell Proteins, Marine Algae as food supplements.	
	2.4	Food supplements and food ingredients as by products – Fishery, poultry/animal husbandry and agriculture/dairy industries.	3L
III	3	Food remedies Food as a remedy	15L
	3.1	Nutraceuticals bridging the gap between food	
	3.1.1	and drugs. Nutraceuticals in treatment for cognitive decline	3L
	3.1.2	Nutraceutical remedies for common	2L
	3.1.3	disorders like Arthritis, Bronchitis, circulatory problems, hypoglycemia, Nephrological disorders, Liver disorders, Osteoporosis, Psoriasis and Ulcers Brief idea about some Nutraceutical rich	4L
	3.2	supplements	6L

	3.2.1	Bee pollen, Caffeine, Green tea, Lecithin, Mushroom Extract.	
	3.2.2	Chlorophyll, Kelp and Spirulina. Anti-nutritional Factors &	
IV	4	Limitations of Nutraceuticals Anti-nutritional factors present in foods	15L
	4.1	Types of inhibitors present in various foods and	
	4.1.1	how they can be inactivated General idea about role of Probiotics and	2L
	4.2	Prebiotics as nutraceuticals. Recent advances in techniques & feeding of substrates. Assessment of nutritional status and	4L
	4.3	Recommended Daily allowances. Non Nutrient Effect of Specific Nutrients :	2L
	4.4	Proteins and Peptides and Nucleotides, Trans fats, Vitamins, Minerals Issues on functional foods and	4L
	4.5	nutraceuticals in animals	3L

References:-

1. Nutraceuticals: Efficacy, Safety and Toxicity by Ramesh C. Gupta
2. Nutraceuticals: The Complete Encyclopedia of Supplements, Herbs, Vitamins and Healing Foods by Arthur J. Roberts, Genelle Subak-Sharpe, et al.
3. Advances in Nutraceutical Applications in Cancer: Recent Research Trends and Clinical Applications (Nutraceuticals) by Sheeba Varghese Gupta and Yashwant V Pathak
4. Nutraceuticals in Health and Disease Prevention (Infectious Disease and Therapy Book 6) by PETER. PAUL HOPPE, Klaus Kramer, et al.
5. Nutrigenomics and Nutraceuticals: Clinical Relevance and Disease Prevention by Yashwant V. Pathak and Ali M. Ardekani
6. Pharmaceuticals to Nutraceuticals: A Shift in Disease Prevention by Dilip Ghosh and R.B.Smarta
7. Handbook of Nutraceuticals and Functional Foods (Modern Nutrition) by Robert E.C. Wildman and Richard S. Bruno

Course Code : RPSBCHP204

Course Title: Practicals based on Nutraceutical and Functional Foods

DETAILED SYLLABUS

Course Code	Course/ Unit Title	Credits
RPSBCHP204	1. To determine the lactose present in the Soy-milk by Cole's method 2. Determination of reducing sugars by Nelson: Somogyi Method 3. Protein Estimation by Bradford's method 4. Determination of Hardness of water 5. Estimation of Chlorogenic acid (Anti-Nutritional Factor) 6. Estimation of phytic acid by Heubner and Stadler Method 7. Estimation of Vitamin C by Folin Phenol method 8. Optimization and Analysis of probiotics 9. Comparative assessment of Fat content in Full cream milk and low fat milk.	2

Modality of Assessment
RPSBCH204 (Discipline
Specific course)
Nutraceutical and Functional Foods

Theory Examination Pattern:

A. Internal Assessment- 40%- 40 Marks

B. External Examination- 60%- 60 Marks

Semester End Theory Examination: (Deviation from the usual modality) Owing to the pandemic situation prevailing in 2020 and continuing in 2021, the external examinations (Semester End) may be conducted online as per the instructions/circulars received from the University of Mumbai and Maharashtra State notifications from time to time. The conventional mode of external examination will commence again only after the declaration of normalcy by the Government authorities.

1. Duration - These examinations shall be of 02 ½ HOURS duration.
2. Theory question paper pattern:

Paper Pattern:

Questions	Pattern	Marks	Question based on
Q.1 A)	Any 1 out of 2	8	Unit I
Q.1 B)	compulsory	7	
Q.2 A)	Any 1 out of 2	8	Unit II
Q.2 B)	compulsory	7	
Q.3 A)	Any 1 out of 2	8	Unit III
Q.3 B)	compulsory	7	
Q.4 A)	Any 1 out of 2	8	Unit IV
Q.4 B)	compulsory	7	

	TOTAL	60M	
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Practical Examination Pattern:**A. Internal Examination: 40%– 40 Marks**

Particulars	Practical I, II, III & IV
Journal	05
Experimental tasks	15
Total	20

B. External Examination: 60%– 60 Marks**Semester End Practical Examination:**

Particulars	Practical I, II, III & IV
Laboratory work	25
Viva	5
Total	30

Course Code: RPSBTK205

Semester II

Course Title: Intellectual Property Rights

(30 Hours – 2 Credits Course)

COURSE OUTCOMES: On course completion, the student should be able to:

COURSE OUTCOME	DESCRIPTION
CO 1	Elaborate on the rules and regulations for patenting.
CO 2	Distinguish between copyright, Trademark, GI and Industrial designs.
CO 3	Interpret different case laws in biotechnology.
CO 4	Discuss the roles and responsibilities of the patent officer and the institution.
CO 5	Examine various patent applications.
CO 6	Summarize the various case studies associated.

DETAILED SYLLABUS
Course/ Unit Title

Course Code	Unit		Credits/ Lectures
RPSBTK 205	I	<p>Intellectual Property Rights: International agreements and Indian legislature</p> <p>Introduction to IPR;</p> <p>Globalization ; development of GATT, WTO, TRIPS agreement;</p> <p>Important provisions under TRIPS (Article/s 3, 4, 31/31f) agreement;</p> <p>Important provisions/ considerations under Geographical indications act, UPOV and PVPFRA</p> <p>Indian Copyrights act (including sec 13, 14, 17, 18, 19, 33, 14/57)</p> <p>Creative commons,</p> <p>Indian Trademarks act (including trademark classification),</p> <p>Madrid system for Trademarks,</p> <p>Traditional knowledge and Bio-piracy, TKDL;</p> <p>Differences among copyright, Trademark, GI and Industrial designs; Important doctrines (spring-board doctrine, doctrine of first-sale, idea-expression dichotomy, IP transfer</p> <p>IP Protection in India: Legislative structure and remedies (Infringement v/s passing off remedies)</p> <p>Civil remedies:</p> <ol style="list-style-type: none"> 1. Injunction: Permanent, Interlocutory/ temporary, Mareva injunction 2. Anton-Pillar order 3. John Doe order 4. Damages &/or accounts of profit <p>Criminal:</p> <ol style="list-style-type: none"> 1. Imprisonment 2. Fine 3. Both <p>Custom remedies and de minimis principle</p>	15

	II	<p>Indian Patents act, 1970 Indian patents act, 1970 and rights of patentee (section 48), Principles of patent protection (sec 83); Patenting biotech inventions: objectives, concept of novelty, concept of inventive step, non-patentable objects (sec 3/4), moral issues in patenting biotech inventions; Important case laws under Biotechnology a) Harvard onco-mouse case, b) Diamond vs Chakrabarty case, c) Turmeric case, d) Hoodia cactus case.</p> <p>Budapest treaty and protection of micro-organisms, Patent databases and patent search. International patent classification (https://www.wipo.int/classifications/ipc/en/) Types of patents (Ordinary, Conventional, PCT, Patent of addition, Divisional patent, etc.), patent filing timeline Parts of a patent application, Patent claims (types and embodiment), Patent infringement based on sec 48 Exhaustion doctrine and parallel import Transfer of patent rights and Compulsory licensing Important case laws: Glivec case (section 3d), Natco v/s Bayer case.</p>	15
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REFERENCES:

1. https://www.wipo.int/edocs/mdocs/africa/en/wipo_tiscs_znz_16/wipo_tiscs_znz_16_t_6.pdf
2. <https://www.lexisnexisip.com/knowledge-center/totalpatent-one-and-the-usptos-seven-step-patent-search-strategy/>
3. <https://www.khuranaandkhurana.com/wp-content/uploads/2017/01/ANATOMY-OF-PATENT-SPECIFICATION.pdf>
4. https://www.wipo.int/edocs/mdocs/aspac/en/wipo_ip_phl_16/wipo_ip_phl_16_t5.pdf
<http://www.mondaq.com/india/x/667450/Patent/Patent+Claims+And+Their+Type+s>

Modality of Assessment

Semester II

Theory Examination Pattern

D. Internal assessment -40%-40 Marks

Sr. No	Evaluation Type	Marks
1	One Assignment /case study/project based/Written assignment/Presentations	20
2	One class test (Multiple choice questions)	20

E. External Examination- 60%-60 Marks

Semester End Theory Examination:

7. Duration: These examination shall be of 2.5 hrs

8. Theory question paper pattern

- There shall be 4 questions each of 15 Marks. On each unit there will be one question
- All questions shall be compulsory with internal choice within the questions

Paper Pattern:

Questions Pattern	Marks	Question based on
Q.1 A)	Any 1 out of 2	Unit I
Q.1 B)	compulsory	
Q.2 A)	Any 1 out of 2	Unit II
Q.2 B)	compulsory	
Q.3 A)	Any 1 out of 2	Unit III
Q.3 B)	compulsory	
Q.4 A)	Any 1 out of 2	Unit IV
Q.4 B)	compulsory	
	TOTAL	60M

Practical Examination Pattern:

- D. External Examination- 50 Marks
Semester End Practical Examination

Particulars	Paper
Laboratory Work	40
Journal	05
Viva	05
Total	50

Modality of Assessment

Semester II

AECC-2

Assessment methods:

Semester End Theory Examination	• 50 Marks
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Overall Examination and Marks distribution Pattern
Semester I

Course	CC/DSE		AECC	total
	RPSBTK201/202/203/DSE			
	Internal	External	External	
Theory	40	60	50	450
Practicals		50	-	200