



Resolution number: AC/II(23-24).2.RPS1

S. P. Mandali's

Ramnarain Ruia Autonomous College

(Affiliated to University of Mumbai)



Syllabus for:

Program: M.Sc. in Bioanalytical Sciences

(Postgraduate Syllabus)

Program Code: RPSINBAS

(As per the guidelines of National Education Policy 2020-
Academic year 2024-25)

(Choice based Credit System)



Graduate Attributes

S. P. Mandali's Ramnarain Ruia Autonomous College has adopted the Outcome Based Education model to make its science graduates globally competent and capable of advancing in their careers. The Bachelors Program in Science also encourages students to reflect on the broader purpose of their education.

GA	GA Description A student completing Bachelor's/Master's Degree in Science program will be able to:
GA 1	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.
GA 6	Use an objective, unbiased and non-manipulative approach in collection and interpretation of scientific data and avoid plagiarism and violation of Intellectual Property Rights. Appreciate and be 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 Master's Degree in Science program in the subject of Bioanalytical Sciences will be able to:
PO 1	Gain high quality science education in a vibrant academic ambience with the faculty of distinguished teachers and scientists.
PO 2	Take up the challenge of doing quality research and teaching and also contribute to industrial production and R & D in the fields of Bioanalysis, Bioinformatics and Nutraceutical Sciences.
PO 3	Amalgamate classical analytical chemical techniques with modern genomic and proteomic technologies of manufacturing and analysis to better characterize the products useful as medicines as well as nutraceuticals.



Elective Course: RPSINBAS.0506
Course Title: Nutraceuticals and Functional Foods I
Academic year 2024-25

COURSE OUTCOMES

COURSE OUTCOME	DESCRIPTION
CO 1	Describe nutraceutical sciences and compare nutraceuticals and pharmaceuticals
CO 2	Summarize quality control and quality assurance of nutraceuticals

DETAILED SYLLABUS

Paper Code	Semester I- Paper VI	Credits/ Hours
RPSINBAS.0506	Nutraceuticals and Functional Foods I	3/45
506.1: Human nutrition and Clinical Dietetics		
1. Biomolecules and their metabolism 2. Introduction to nutrition – Concepts of nutrition (adequate, optimum & good nutrition, malnutrition), nutrients and energy, Food as source of nutrients, functions of food, 3. Inter relation between nutrition and fitness 4. Nutritional requirements and special dietary needs 5. Human physiology, Disease and Nutrition		15
506.2: Overview of Nutraceuticals		
1. Introduction to Nutraceuticals as Science and difference between pharmaceutical and nutraceutical sciences 2. Properties, structure and functions of various Nutraceuticals 3. Food as remedies and Anti-nutritional Factors present in Foods 4. Classification and scope of nutraceuticals 5. Use of dietary supplements and its regulation		15
506.3: Analysis of Nutraceuticals		
1. Functional Foods and nutritional Genomics 2. Biological controls for nutraceuticals 3. Analysis of Nutraceuticals using conventional and modern methods 4. QC/ QA and other regulations for nutraceutical products		15



RPSINBASP506: PRACTICAL

1. Extraction and estimation of total sugars from any nutraceutical food product. 2. Estimation of crude fat content of raw material/nutraceutical by Soxhlet's method 3. Estimation of crude fiber/pectic substances from raw material/nutraceutical 4. Estimation of Ca, Na and K in finished products by flame photometry. 6. Estimation of bio burden by Viable Count method. 7. Research Review for nutraceutical product development.	1/30
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References:

1. Handbook of Nutraceuticals and Functional Foods: Robert E.C. Wildman , PhD
2. Nutraceuticals: Efficacy, Safety and Toxicity: Ramesh C Gupta, Rajiv Lall, Ajay Srivastava
3. Functional Foods and Nutraceuticals: Bioactive Components, Formulations and Innovations: Chukwuebuka Egbuna, Genevieve Dable Tupas
4. Industrial Application of Functional Foods, Ingredients and Nutraceuticals:
C. Anandharamakrishnan, Parthasarathi Subramanian
5. Functional Foods and Nutraceuticals: Rotimi E. Aluko



Elective Course: RPSINBAS.0507
Course Title: Nanotechnology
Academic year 2024-25

COURSE OUTCOMES

COURSE OUTCOME	DESCRIPTION
CO 1	Describe the methodologies for synthesis of nanoparticles
CO 2	Relate characterisation in synthesis of nanoparticles
CO 3	Discover medical applications of nanoparticles

DETAILED SYLLABUS

Paper Code	Semester I- Paper VII	Credits/ Hours
RPSINBAS.0507	Nanotechnology	3/45
507.1: History & Synthesis of Nanoparticles		
1. Introduction to nanoparticles, classification of nanoparticles 2. Biological synthesis of nanoparticles 3. Chemical methods for synthesis of nanoparticles 4. Applications of nanoparticles with special emphasis on biological applications		15
507.2: Characterisation of Nanoparticles		
1. Properties of nanoparticles with respect to characterization 2. Optical studies on nanoparticles: Spectroscopic methods 3. Size estimation of nanoparticles: Transmission Electron Microscopy (TEM), X-ray Diffraction, Surface Area Analysis (BET), Photon Correlation Spectroscopy (PCS) 4. Structural and elemental analysis of nanoparticles: IR Analysis, XRD Analysis, estimation of crystallite size analysis using Scherr Formula, % Crystallinity 5. Thermal properties analyses: DTA, TGA-DSC techniques		15
507.3: Industrial and Medical applications of Nanotechnology		
1. Nanoparticles for bioanalysis 2. Nanotechnology for drug delivery and diagnostics 3. Nanotechnology in food packaging 4. Nanotechnology in Agriculture		15

RPSINBASP507: PRACTICAL

1. Synthesis of silver nanoparticles using herbal extracts
2. Synthesis of copper nanoparticles
3. UV-Vis study of synthesized nanoparticles
4. Particle size analysis of nanoparticles
5. Demonstration of SEM/TEM
6. Scientific writing (Value Addition): Abstract Writing, Scientific referencing formats, Graphical representation.

1/30

References:

1. Sharron G Penn, Lin He, Michael J Natan, Nanoparticles for bioanalysis, Current Opinion in Chemical Biology, Volume 7, Issue 5, 2003, Pages 609-615, ISSN 1367-5931, <https://doi.org/10.1016/j.cbpa.2003.08.013>.
(<https://www.sciencedirect.com/science/article/pii/S1367593103001169>)
2. RüstemKeçili, Sibel Büyüktiryaki, Chaudhery Mustansar Hussain, Advancement in bioanalytical science through nanotechnology: Past, present and future, TrAC Trends in Analytical Chemistry, Volume 110, 2019, Pages 259-276, ISSN 0165-9936, <https://doi.org/10.1016/j.trac.2018.11.012>.
(<https://www.sciencedirect.com/science/article/pii/S0165993618304138>)
3. Nanotechnology: An Introduction to Synthesis Properties and Applications of Nanomaterials
4. Introduction to Nanoscience and Nanotechnology: Chattopadhyay, Chattopadhyay K. K. and A. N. Banerjee
5. Nanotechnology in Drug Delivery: Glen S. Kwon, Melgardt M. de Villiers, Pornanong Aramwit
6. Nanotechnology-Fundamentals and Applications: Manasi Karkare



Elective Course: RPSINBAS.E516
Course Title: Nutraceuticals and Functional foods II

Academic year 2024-25

COURSE OUTCOMES

COURSE OUTCOME	DESCRIPTION
CO 1	Apply the concepts of molecular biology in making nutraceuticals and functional foods.
CO 2	Devise marketing strategies for Nutraceuticals

DETAILED SYLLABUS

Paper Code	Semester II	Credits/ Hours Lectures
RPSINBAS.E516	Nutraceuticals and Functional Foods II	3/45
516.1	Molecular Biology and Biotechnology for Nutraceuticals and Functional Foods	15
	<ol style="list-style-type: none"> 1. New technologies in development of Nutraceuticals and functional foods 2. Scope of Genetic engineering, library construction and screening 3. Applications of plant and animal biotechnology 4. Plants as factories 5. Nutraceuticals and the Future of Medical Science 	
516.2	Development of Nutraceutical Products	15
	<ol style="list-style-type: none"> 1. Metabolic engineering & industrial products 2. Development of Novel Food and Food Ingredients 3. Future of health management and consumer views 4. Application of some technologies in development of Nutraceuticals and functional foods 5. Chemoprevention and Nutraceuticals 	
516.3	Marketing of Nutraceutical Products	15



<ol style="list-style-type: none"> 1. Nutraceutical Industry and Market Information 2. Consumers' views on nutraceuticals 3. Packaging strategies, and labelling and claims for nutraceutical products 4. The food industry's role in promoting functional foods 5. The role of marketing Communication in the introduction of functional foods to the Consumer 	
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RPSINBASP.E516	PRACTICAL	Credits/ Hours 1/30
<ol style="list-style-type: none"> 1. Detection of food additives (MSG, Flavours, colours (biological and non-biological etc.) in packaged food products 2. Study of comparative antimicrobial activity of the following: Penicillin and Curcuma / thyme 3. Production of industrially important enzymes by micro-organisms (Protease and Amylase) 4. Preparation of traditional health products – e.g. Satavari kalp, gulkand, Amla syrup, etc. 5. Extraction and identification of Isoflavones by TLC. 6. To prepare a market survey report on the any one Nutraceutical functional food product. 		



Elective Course: RPSINBAS.E517

Course Title: Forensic Science

Academic year 2024-25

COURSE OUTCOMES

COURSE OUTCOME	DESCRIPTION
CO 1	Describe the basics of forensic sciences
CO 2	Summarize forensic pharmacology and toxicology and apply analytical instrumentation.
CO 3	Pivot practical aspects in forensic analysis

DETAILED SYLLABUS

Paper Code	Semester II - Paper VII	Credits/ Hours
RPSINBAS.E517	Forensic Science	3/45
517.1: Introduction to Forensic sciences		
1. Forensic Science: Definition of Forensic Science, The Role of the Forensic Laboratory 2. History and Development of Forensic Science in India & Abroad, Pioneers in Forensic Science 3. Multidisciplinary nature, Forensic Technology solving crimes with advanced technology, Forensic intelligence, and Interviews. 4. Forensic Evidences: Concise of Forensic Physical, Biological, Chemical and Psychological evidences, Medico-Legal Cases. 5. Introduction to Quality management Systems, Organizations involved in setting guidelines and maintaining quality system		15
517.2: Forensic Pharmacology & Toxicology		
Forensic Toxicology (08 Lectures) 1. Introduction 2. International organization related to Forensic Toxicology 3. Different mode of Elements of Forensic Toxicology, Applications 4. Scientific Principles, Instrumentation and equipments, Nature of cases, Role of the Forensic Toxicologist 5. Laws related to Forensic Toxicology.		15
Forensic Pharmacology (07 Lectures) 1. Detection of poison on the basis of their metabolic studies 2. Some Examples of Applied Biotransformation Knowledge of Codeine,		



Morphine, Amphetamine Benzodiazepines etc.	
517.3: Analysis in Forensic Sciences	
<p>1. The Role of the Laboratory in Diagnosis and Treatment of Poisoning, Current Practices Value and Limitations of Laboratory Testing, Laboratory Accuracy or Error Outcome Studies, The Structure of Clinical Toxicology Testing.</p> <p>2. Analysis of Poisons: Inorganic poisons (cations and anions), Neutral poison (organic non-volatile), Method of analysis of Basic drugs / poisons, Method of analysis of Acidic drugs / poisons, Method of analysis of metallic poisons and volatile poisons, Analysis of samples taken under Food Adulteration Act, Toxicological analysis of decomposed materials.</p> <p>3. Forensic Characterization of Hair, Blood, semen, saliva</p> <p>4. Forensic Significance of DNA profiling</p> <p>5. Chromatography and spectroscopy in forensic analysis</p>	15
RPSINBASP.E517: PRACTICALS	Credits/Hours
<p>1. Presumptive Drug Testing by Color/spot test/Microcrystalline testing/HPLC/GC</p> <p>2. Melting Point determination of some substances of forensic interest</p> <p>3. Analysis of forensically important cosmetics</p> <p>4. TLC separation of pesticides/insecticides & Identification using chromomeric reagents</p> <p>5. Microscopic Identification of plant poisons</p> <p>6. Analysis of hair, blood and dried blood spots</p> <p>7. DNA fingerprinting in forensic analysis</p>	1/30

References:

1. J A Siegel, P.J Saukko (2000) Encyclopedia of Forensic Sciences Vol. I, II and III, Acad. Press.
2. Casarett & Doll Toxicology (2003) The Basic Science of poisons.
3. MaThew E. Johll (2009) Investigating Chemistry: A Forensic Science Perspective
4. JJ Fenton (2002) Toxicology A CLi R. (2008) Forensic Biology, Taylor & Francis Group LLC.ase-Oriented Approach