Department of Applied Nutrition and Public Health

Nutrition is the intake of food, considered in relation to the body's dietary needs. Good nutrition – an adequate, well balanced diet combined with regular physical activity – is a cornerstone of good health.

Nutrition is the science that interprets the interaction of nutrients and other substances in food in relation to maintenance, growth, reproduction, health and disease of an organism. It includes food intake, absorption, assimilation, biosynthesis, catabolism, and excretion.

Mission and Vision of the Department

Name of the Department : Department of Applied Nutrition and Public Health

Mission of the Department

1. Contributing to the knowledge-base of nutrition to undergraduate students through high quality teaching, training,
2. Provision of credible, current and practical nutrition information to students
3. Contributing to the fundamental knowledge of how nutrients and food components function at cellular, systematic, and whole body levels and impact human health and disease
4. Create and share knowledge to ensure a safe, hygienic food practices, to develop knowledge and skills in health advocacy
5. Inspiring healthy eating and food choices
6. Effective application of nutrition knowledge to improve human health and well-being enhancing professional skills in students
7. To identify innovative directions for dietetic practice
8. To bring awareness about the role of nutrition in interdisciplinary practice
9. To foster the development of critical analysis to enable students to apply current knowledge in human nutrition to the practice of dietetics and other career opportunities related to foods and nutrition

Vision of the Department

1. To expand intradepartmental, interdepartmental, and external research projects that focus on current food and nutrition issues.
2. To contribute to the development of a strong dietetic profession
3. To have high societal impact on solving food, nutrition, and health challenges using innovative research and translational approaches and training future nutrition leaders

Programme Outcomes

Name of the Department : Department of Applied Nutrition and Public Health
Name of the Programme : Applied Nutrition and Public Health

PO - BCAN – Biochemistry, Chemistry, Applied Nutrition
Sarojini Naidu Vanita Maha Vidyalaya is the only college in the twin cities of Hyderabad offering the combination of Nutrition with Bio-chemistry. All other colleges offer Applied Nutrition with either Botany or Zoology. Chemistry however is a compulsory optional for Life Sciences subjects.

**Co-relation of Nutrition with Biochemistry and Chemistry**

**Nutrition**
Nutritional science is the study of nutrients, their function and how they are involved in health and disease. The goal is to ensure specific nutritional guidelines suitable for different groups of people depending on their age, sex, activity level and special groups such as in pregnancy or disease. It is a relatively new discipline and began to evolve the last 100 years, even though the importance of diet to maintain health was recognised a lot earlier. It is an applied subject that draws information from many other biological areas particularly biochemistry, therefore a good understanding of biochemistry is required to fully understand nutrition.

**Biochemistry**
Nutritional bio-chemistry is rooted in analytical methodology that permits the purification of individual nutrients and the determination of their structures, as well as in classical biochemical approaches that identify metabolic pathways and elucidate the role of dietary components in regulating metabolism and gene expression.

Nutritional biochemistry specifically focuses on nutrient chemical components, and how they function biochemically, physiologically, metabolically, as well as their impact on disease. Nutritional Biochemical research is mostly involved upon defining dietary and nutritional needs in sick and healthy individuals and the reduction of side effects of pharmaceutical drugs.

Nutritional scientists employ many of the techniques used in biochemistry, although nutritionists are more health oriented and concerned particularly with nutrients. In fact, the wealth of knowledge of nutrition is greatly attributed to biochemists.

**Chemistry**
Understanding chemistry will give an understanding of biochemical processes within the human body. Biochemical processes such as digestion of food. It will also gives an insight into what the human body needs in order for it to work properly & from that, one can understand what foods need to be added to a person’s diet if they are ill. And it will also help understand other processes in the body.

The food industry is a field in which chemistry plays an important role, contributing with new procedures of analysis and instrumentation. Analytical chemistry is a branch of chemistry which deals with analysis of chemical substances of all sorts.

**Food chemistry** is the study of chemical processes and interactions of the biological and nonbiological components of foods. It overlaps with biochemistry in that it deals with the components of food such as carbohydrates, lipids, proteins, water, vitamins, and dietary minerals. In addition, it involves the study and development of food additives that can be used to preserve the quality of food or to modify its color, flavor, and taste. It is, thus, closely linked to food processing and preparation techniques. Food chemistry allows for subjecting
food materials to chemical scrutiny. It employs chemistry tools to analyse food items so that they transform to nutritious, safe and materials of commercial value. Instruments that are popular in the vicinity of chemistry are employed in food chemistry.

**Programme Specific Outcomes**

Name of the Department : Department of Applied Nutrition and Public Health

Name of the Programme : Applied Nutrition and Public Health

**PS01 - SEC 1 - Food Service Management Skills** (subject specific)

**SEC 2 - Quantity Food Production Skills** (subject specific)

**SEC 1 - Food Service Management Skills**

**Food Service Management** provides the opportunity for students to acquire those skills that are necessary to operate and manage a multitude of food service operations. The curriculum enables students to develop their managerial, functional, operational, and analytical capabilities to maximize their success in hospitality and food service management industry. An important component of the curriculum which contributes to professional development is supervised field experience. This experience offers students a means of gaining valuable hands-on experience that further prepares them for a dynamic career in the industry.

Foodservice defines those businesses, institutions, and companies responsible for any meal prepared outside the home. This industry includes restaurants, school and hospital cafeterias, catering operations, and many other formats.

The food service management training programs focus on food preparation, sanitation, nutrition, and business administration subjects. The course work allows students to familiarize with the intricacies of running a successful food service outlet.

Hospital food service managers provide leadership in private and public healthcare facilities. They handle administrative roles relating to food preparation, staff, inventory, maintaining operational standards, and more. Being nutritionists, they plan menus as per patient requirement along with the kitchen staff. This is aimed at ensuring that the meals are adequately varied, nutritious, and suit the specific needs of individual patients. Hospital food service managers have the added responsibility of satisfying the dietary restrictions of patients.

Considering the difficulty of the job and the growing skill set required in handling food service, it is an additional advantage of having Food Service Management as a Skill Enhancement Course in the Semester III.

**SEC 2 - Quantity Food Production Skills**

**Quantity Food Production** skills involve a thorough understanding of menu planning, recipe standardization, service procedures for quality foods, human resource utilization, hazard analysis of critical control points, and costing.
The students understand the biological, physical, and chemical changes which occur when food is cooked and stored. They develop further knowledge of the factors which affect food composition, food quality and yield and food preparation factors which affect the nutritional value of food.

The students are exposed to the fundamentals of food preparation, and application of these principles to quantity food production in commercial and non-commercial settings. Emphasis is placed on the use of quantity food preparation equipment, menu planning, and production.

They understand principles of food service safety and accident prevention in the quantity kitchen environment. They are familiar with quantity preparation, service, and holding equipment, and understand function, use, and maintenance of equipment. They develop the ability to plan nutritious, appealing food combinations and menu patterns that meet the needs of the defined clientele within economic and physical limitations of a food service facility. Using the knowledge about a facility, the student will plan a menu to incorporate food/recipe composition, flavor, color, texture, temperature, shape and form. They scale recipes to serve a forecasted number of clients with a consistent (expected) quality outcome. Understand the purpose of food distribution systems and the role of marketing and merchandising in the business of food service. Increase knowledge and empathy of the responsibilities and duties of the food production manager and gain skill in theoretical solution of everyday supervision and organization of work of the food service department.

PS 02 – GE 1 - Fundamentals of Food and Nutrition (inter-disciplinary)
GE 2 - Perspectives of Food Safety in India (inter-disciplinary)

The Generic Elective has been introduced with the objective of exposing students from other faculties to Nutrition. The chosen topics cover the basics of nutrition and can be easily understood by the students.

GE1 - Fundamentals of Food and Nutrition

“Fundamentals of Food and Nutrition” aims at developing basic understanding about nutrition, its effect on human health and newer advances in food technology. This course encompasses physiological, biochemical and social aspects of food and discusses relationship between metabolites and human health.

Good nutrition is an important part of leading a healthy lifestyle. Combined with physical activity, diet can help one reach and maintain a healthy weight, reduce, risk of chronic diseases (like heart disease and cancer), and promote overall health.

The importance of nutrition education as a means for improving nutrition of the community in the developing countries has increased rapidly during the recent past. Lack of awareness about the dietary requirements and nutritive value of different food is the main cause for prevailing malnutrition among school children, pregnant women, lactating mother and other vulnerable sections of the community.

The effective management of food intake and nutrition are both key to good health. Smart nutrition and food choices can help prevent disease. Eating the right foods can help your body cope more successfully with an ongoing illness. Understanding good nutrition and paying attention to what one should eat to help maintain or improve health.
GE 2 - Perspectives of Food Safety in India
“Perspectives of Food Safety in India” aims at providing an insight into the various aspects of food safety, food handling, food adulteration and various legislations introduced to keep food safe.

The Food safety is a scientific discipline describing handling, preparation, and storage of food in ways that prevent food-borne illness. The maintenance of good health demands that food should not only be nutritious but also safe and of good quality. There has been growing concern regarding environmental contamination of food and excessive use of chemicals in food production and processing in the country in recent times.

In this modern era of globalization and industrial growth, one of the key questions that need attention in a developing country like India is that of food safety. In India, the full burden of food borne illnesses is not known; most food borne illnesses go unreported. India is struggling with age old problem of poor environmental sanitation, lack of access to safe water and poor disease surveillance. These hazards are in addition to the menace of food adulteration. The government of India introduced the food safety and Standards Act 2006 to overcome the deficiencies in the Prevention of food adulteration act, 1954. To achieve food safety, the public health sector must play a pivotal role in building a community of various stakeholders and partners, who share common goals and responsibilities.

Many food safety challenges faced by people in India need multi-dimensional approach. In order to motivate self-directed changes in practices at individual or household level, people need to be given not only the scientific rationale to alter the established food related practices but also the means and resources to practice the safe ones.

Course Outcomes

Name of the Department : Department of Applied Nutrition and Public Health
Name of the Programme : Applied Nutrition and Public Health

Name of the Course
CO1 - Nutritional Biochemistry  1 – Sem 1
Nutritional Biochemistry  2 – Sem 2
CO 2 – Food Science - Sem 3
Family and Community Nutrition - Sem 4
CO 3 - Clinical Dietetics - Sem 5
Food Hygiene and Sanitation
CO 4 Food Preservation - Sem 6
Public Health

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<tr>
<th>Course</th>
<th>Semester</th>
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<th>Unit</th>
<th>Learning outcome</th>
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<tbody>
<tr>
<td>CO 1</td>
<td>I</td>
<td>Nutritional Biochemistry 1</td>
<td>Unit 1 Introductory Nutrition</td>
<td>Thorough understanding of nutrition basics - food groups, body needs for nutrients and carbohydrates – sources, process of digestion, metabolism and utilization.</td>
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<td>Unit 2 Proteins</td>
<td>Understand proteins and their role and utilization in body processes, functional importance of nucleic acids</td>
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<td>Unit 3 Lipids</td>
<td>Lipid metabolism and implications of excessive consumption of fats in the diet as also importance of lipids in human nutrition</td>
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<td>Unit 4 Energy Metabolism</td>
<td>Rationale for differences in energy requirement of different physiological groups. Maintaining energy balance and Ideal body weight.</td>
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<tr>
<td>CO 2</td>
<td>II</td>
<td>Nutritional Biochemistry 2</td>
<td>Unit 1 Vitamins</td>
<td>Understanding importance of Vitamins – classification, sources, impact of excess and deficiency in human nutrition.</td>
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<td>Unit 2 Minerals</td>
<td>Understanding importance of Minerals – classification, sources, impact of excess and deficiency in human nutrition.</td>
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<td>Unit 3 Water and Electrolyte Balance</td>
<td>Water as a nutrient, water and electrolyte imbalance and its regulation and diseases associated.</td>
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<td>Unit 4 Enzymes and Hormones</td>
<td>Role of Enzymes and Hormones in human physiology.</td>
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<tr>
<td>CO 3</td>
<td>III</td>
<td>Food Science</td>
<td>Unit 1 Basics of Food Science, Cereals and Millets</td>
<td>Thorough understanding of the role of food in human nutrition, cooking methods, minimising nutrient losses during cooking, importance of functional foods. Importance and role of Cereals and Millets in cookery.</td>
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<td>Unit 2 Pulses and Legumes, Milk and Milk Products</td>
<td>Importance and role of pulses, legumes, milk and milk products in cookery.</td>
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<td>Unit 3 Fleshy Foods, Spices, Condiments and Beverages</td>
<td>Importance and role of Fleshy Foods, Spices, Condiments and Beverages.</td>
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<td>Course</td>
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<td>Unit 4</td>
<td>Vegetables and Fruits, Sugar and Jaggery, Fats and Oils</td>
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</table>

**CO 3 – Learning Outcome** - Complete understanding of the different food groups, their use in cookery, their health benefits and their use in everyday dietary regimen.

**CO 4**  
**Family and Community Nutrition**  
**Unit 1** Basics of Meal planning  
Thorough understanding of the concept of balanced diet, RDA its rationale, principles of menu planning and requirements of different physiological age groups.  
**Unit 2** Nutritional Requirement during Pregnancy, Lactation and Infancy  
Understand the nutritional needs of Pregnant and Lactating women and infants.  
**Unit 3** Nutrient Requirement for Pre-schoolers, School going child, Adolescent  
Understand the nutritional concerns during pre-school, school going and adolescent ages, planning of packed lunches.  
**Unit 4** Nutritional Requirement for Geriatric Group and Nutritional Assessment  
Understand the nutritional needs of the elderly, basics and importance of Nutritional Assessment in clinical practice.

**CO 4 – Learning Outcome**- Complete understanding of importance of balanced diet for different physiological ages right from infancy to geriatrics. Relevance of Nutritional assessment in the community.

**CO 5**  
**Clinical Dietetics**  
**Unit 1** Principles of diet in diseases, Critical care nutrition, Dietary Management in Fevers, Typhoid & TB.  
Thorough understanding of diet therapy, role of dietician in community, therapeutic diets, care of critically ill patients. Dietary concerns in fever, typhoid, TB  
**Unit 2** Aetiology Dietary management - GI diseases, Renal disorders, Liver Disorders  
Through understanding of Aetiology, symptoms, screening, medications and dietary regimen for GI diseases, Renal disorders, Liver Disorders  
**Unit 3** Aetiology Dietary management of Obesity, Diabetes, CVD and Hypertension  
Through understanding of Aetiology, symptoms, screening, medications and dietary regimen for Obesity, Diabetes, CVD and Hypertension

**Learning Outcome CO 5** – Complete understanding of principles of Therapeutic Nutrition and Medical Nutrition Therapy in Critical Care, GI diseases, Renal and Liver disorders, Obesity, Diabetes, CVD, Hypertension and role of dietician.
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<th>Course</th>
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<th>Unit</th>
<th>Learning outcome</th>
</tr>
</thead>
</table>
| CO 5   | V        | Food Hygiene and Sanitation | Unit 1 | Definition of Public Health, Hygiene, Social and preventive medicine, basic aspects of personal hygiene.  
Food handling and Public Health: Preventing food borne illness and the speed of communicable disease; Sanitation of food serving institution; environmental sanitation, hygiene in food handling and personal hygiene of food handler.  
Epidemiology methods, introduction to Analytical, Experimental and Descriptive methods, diseases transmission.  
Thorough understanding of concept of public health as an emerging field in nutrition.  
Understanding the causative factors for food borne illnesses, role of food handler in causing food borne diseases.  
Importance of epidemiology and its role in nutrition research. Disease transmission and control of causative factors. |
|        |          |       | Unit 2 | Food Borne Disorders:  
Food borne infections- Typhoid, Para typhoid, cholera, infectivehepatitis, amoebiasis  
Food borne intoxications- Disorders caused by; Natural toxins, chemical toxins and  
Microbiological toxins in food- Staphylococcal intoxication, Botulism, Clostridium perfringens, Mycotoxins.  
Water- sources, Impurities- Principles of water purification- commercial and Domestic.  
Understanding of disease transmission in food borne infections, intoxication, and role of microbial toxins in causing food borne illnesses  
Understanding of water purification both domestic and commercial. |
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<tbody>
<tr>
<td>CO 5</td>
<td>V</td>
<td>Food Hygiene and Sanitation</td>
<td>Unit 3</td>
<td>Food adulteration: common, adulterants, and health hazards. Food standards and food laws. National and International; PFA,FPO,FAO,MMPO,Agmark,Codex,FSSAI,HACCP,ISO Certification; Consumer guidance society, Consumer rights, Consumer court, Central facilities for assessing food adulteration, Role of food inspectors. Thorough understanding of the causative factors of food adulteration, the role of various agencies in controlling the same. Role of FSSAI in curbing food adulteration and agencies in support of consumer guidance and scope and role of food inspectors.</td>
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<tr>
<td>Learning Outcome – CO 5</td>
<td>Complete understanding of causative factors of food borne diseases, importance of epidemiology, importance of food laws and their role in checking food adulteration.</td>
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<tr>
<td>CO 6</td>
<td>VI</td>
<td>Public Health</td>
<td>Unit 1</td>
<td>Health and Nutrition- education-definition, components, principles of health education, methodology- individual, group and mass methods use of audio visual aids. Medical entomology, Control of household pest with special reference to mosquito, housefly Environmental, chemical, biological and generic control. Effectiveness of audio visual aids in nutrition education Role of vectors in disease transmission and control measures to check the same</td>
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<tr>
<td>Unit 2</td>
<td>• Immunity - Classification, specific and non-specific immunity • Immunoglobulins, • Cellular and hormonal, immune response • Immunization active and passive immunization schedule • Immunizing agents, • Hazards of immunization Thorough understanding of immunity and related aspects.</td>
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<tr>
<td>CO 6</td>
<td>VI</td>
<td>Public Health</td>
<td>Unit 3</td>
<td>Emerging role of PHC in rural areas with special emphasis on maternal and child care. Health programs and their role in protecting health of the community.</td>
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</table>

**Learning Outcome – CO 6** – Understanding of Public Health and impact of audio visual aids on nutrition education, immunity and its role, PHC as a primary contact in health care of community.

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<th>Unit</th>
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<tbody>
<tr>
<td>CO 6</td>
<td>VI</td>
<td>Food Preservation</td>
<td>Unit 1</td>
<td>Food technology and its role in combating malnutrition. Causes and control of food spoilage.</td>
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</table>

Food Technology and its application, Role of Food technology in combating malnutrition in developed countries.

Food spoilage and nutrient losses during storage- physical, chemical and microbial spoilage of foods, agents causing food spoilage.

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<tbody>
<tr>
<td>CO 6</td>
<td>VI</td>
<td>Food Preservation</td>
<td>Unit 2</td>
<td>Importance of food preservation and various methods of food preservation – commercial and home scale methods.</td>
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</table>

Food Preservation- the importance and general principles of food preservation.

Home scale methods of food preservation like drying, refrigeration, pickling, use of sugars. Flow chart for:
- Mango pickle
- Jelly
- Amla ka murabba

Commercial methods of food preservation - Preservation by high temperature-
- Canning, low temperature-Freezing, dehydration-(Sun drying, spray drying, foam mat drying).
- Concentration-
- Vacuum drying, radiation, chemicals and use of preservatives.
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<tr>
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<th>Title</th>
<th>Unit</th>
<th>Learning outcome</th>
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</table>
| CO 6   | VI       | Food Preservation | Unit 3 | Enhancement of nutritional value of foods by food fortification – double fortified salt, enrichment, substitution, supplementation.  
Novel protein foods-Leaf protein, chlorella, spirulina, Noni fruit, Garcinia cambogia.  
Loss of nutrients during processing and enhancement techniques.  
Techniques used to enhance keeping quality of foods and latest developments in food technology. |

**Learning Outcome** – CO 6 – Understanding of principles of food preservation and its importance in controlling spoilage of food. Role of food technology in enhancing shelf life of foods.
SAROJINI NAIDU VANITA MAHA VIDYALYA
DEPARTMENT OF BIOCHEMISTRY

Biochemistry may be defined as a science concerned with chemical nature and chemical behavior of the living matter. It takes into account the studies related to the nature of chemical constituents of living matter, their transformations in biological systems and the energy changes associated with these transformations.

MISSION & VISION OF DEPARTMENT:

Name of the Department: Department of Biochemistry

MISSION OF THE DEPARTMENT:

The mission of the Department of Biochemistry is to build a better future by.

1. Generating new tools and knowledge that will advance our understanding of the living world and enhance the quality of life. Through better medical care/disease prevention measures/nutrition and environment sound and sustainable agricultural and manufacturing process.

2. Leveraging these research activities to provide students with opportunities to participate in genuine, challenging experiential learning activities involving state of the art approaches and technologies.

The mission of this department is to provide undergraduate students with foundational processes as well as the skill sets to critically information. This mission aligns with the institutional and a college mission of educating ungraduates students in the life science through diverse, hands – on, experiential opportunities.

Vision

- Producing quality students trained in the latest tools and technologies.
- To achieve academic excellence in biochemistry, imparting in –depth knowledge to the students, facilitating research activists and cater to the ever changing industrial demand and societal needs.
**PROGRAMME OUTCOMES**

Name of the Programme: BIOCHEMISTRY, PO-BCAN – Biochemistry, Chemistry, Applied Nutrition.

Sarojini Naidu Vanita Maha Vidalaya is the only college in the twin cities of Hyderabad offering the combination of Biochemistry with Nutrition. All other colleges offer Biochemistry with Botany /Zoology, Chemistry however a compulsory is optional for life sciences.

**PROGRAMME SPECIFIC OUTCOMES:**

A biochemical technique provides the opportunity for students to acquire basic information about principles, instrumentation and applications, of these techniques in deducing mol-not, structure and functions of biomolecules.

The programme focuses on various techniques such as homogenization process, VV-Vis spectrophotometry, SDS- PAGE, which is essential for isolation and Characterization of protein. Similarly we have Northern &Southern Blotting Techniques which are useful to isolate DNA sequence of interest.

**COURSE OUTCOMES:**

Name of the Programme: BIOCHEMISTRY

<table>
<thead>
<tr>
<th>CODE</th>
<th>COUSE TYPE</th>
<th>COURSE TITLE</th>
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<tbody>
<tr>
<td>BS-104</td>
<td>CO1</td>
<td>DSC-1A Chemistry of Biomolecules</td>
<td>Semester I</td>
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<tr>
<td>BS-204</td>
<td>CO1</td>
<td>DSC-1B Chemistry of Nucleic Acid</td>
<td>Semester II</td>
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<td>BS-304</td>
<td>CO2</td>
<td>DSC-1C Bioenergetics, Biological Oxidation and Enzymology</td>
<td>Semester III</td>
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<td>BS-404</td>
<td>CO2</td>
<td>DSC-1D Intermediary Metabolism</td>
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<td>BS-503</td>
<td>CO3</td>
<td>DSC -1E Physiology &amp; Clinical Biochemistry</td>
<td>Semester V</td>
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<td>BS-506</td>
<td>CO3</td>
<td>DSE – 1E Molecular Biology</td>
<td>Semester V</td>
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<td>BS-603</td>
<td>CO4</td>
<td>DSC – 1F Nutrition &amp; Immunology</td>
<td>Semester VI</td>
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<td>BS-606</td>
<td>CO4</td>
<td>DSE – 1F Microbiology &amp; r-DNA Technology</td>
<td>Semester VI</td>
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### Course CO1

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<th>Semester</th>
<th>Title</th>
<th>Unit</th>
<th>Unit Topic</th>
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<tbody>
<tr>
<td>CO1</td>
<td>I</td>
<td>Chemistry of Biomolecules</td>
<td>Unit 1</td>
<td>Chemistry of Biomolecules</td>
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<td>Water as biological solvent, PH buffers, Henderson-Hasselbalch Equation</td>
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<td>Unit 2</td>
<td>Carbohydrates</td>
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<td>Classification of Carbohydrates, Polysaccharides, bacterial c-wall</td>
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<td>Unit 3</td>
<td>Lipids</td>
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<td>classification of lipids</td>
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<td>Unit 4</td>
<td>Amino Acids &amp; Proteins</td>
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<td>classification of amino acid and Proteins</td>
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**CO1 – Learning Outcomes** – Understanding of Biomolecules, Their Structure, Functions, and importance.

### Course CO2

<table>
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<th>Semester</th>
<th>Title</th>
<th>Unit</th>
<th>Unit Topic</th>
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<tbody>
<tr>
<td>CO1</td>
<td>II</td>
<td>Nucleic acid &amp; Biochemical Technique</td>
<td>Unit 1</td>
<td>Composition of Nucleic acids</td>
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<td>Purines, pyrimidines nucleotides</td>
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<td>Unit 2</td>
<td>Structure of Nucleic Acids</td>
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<tr>
<td></td>
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<td></td>
<td></td>
<td>Watson &amp; Crick model of DNA</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Unit 3</td>
<td>Spectrophotometric &amp; Centrifugation</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Principles &amp; Applications Spectrophotometry &amp; centrifugation</td>
</tr>
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<td></td>
<td>Unit 4</td>
<td>Chromatographic techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Principle &amp; Application of Chromatography</td>
</tr>
</tbody>
</table>

**CO2 – Learning Outcomes** – Basic understanding of Nucleic acid – Base composition, Structure and its sole as Genetic material.

- Basic understanding of colorimetry & Spectrophotometry – their principle & application principles of other techniques like electrophoresis, Centrifugation Etc.
<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
<th>Title</th>
<th>Unit</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>III</td>
<td>Bioenergetics, Biological Oxidation &amp; Enzymology</td>
<td>Unit 1</td>
<td>Bioenergetics: Concept of free energy entropy, enthalpy, high energy concepts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 2</td>
<td>Biological Oxidation: Structure of mitochondria, chloroplast, etc. Cyclic &amp; Non-Cyclic photosynthesis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 3</td>
<td>Introduction to Enzymology: Enzyme classification methods of Enzymology purification</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 4</td>
<td>Enzyme genetics &amp; enzyme action: Michellis &amp; menton reaction, Allosterism enzymes &amp; other covalent modification</td>
</tr>
</tbody>
</table>

Learning Outcomes: Understanding of free energy concepts, exothermic & endothermic reactions concepts of ETC, enzyme classification, mode of action, M-M-reaction, Allosteric enzymes.

<table>
<thead>
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<th>Unit</th>
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</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>IV</td>
<td>Intermediary Metabolism</td>
<td>Unit 1</td>
<td>Amino acid metabolism</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 2</td>
<td>Carbohydrate metabolisms concepts of Glycolysis Krebcycle</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Unit 3</td>
<td>Lipid metabolism</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>Unit 4</td>
<td>Nucleic metabolism Purine &amp; Pyrimidine metabolism &amp; disorders</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
<th>Title</th>
<th>Unit</th>
<th>Unit Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>V</td>
<td>Physiology and Clinical Biochemistry</td>
<td>Unit 1</td>
<td>Physiology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 2</td>
<td>Endocrinology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 3</td>
<td>Organs &amp; Organ Function Test</td>
</tr>
</tbody>
</table>

Course Outcome: Understanding of basic function of heart, muscle, Digestion & absorption of carbohydrate, lipids & proteins. Organization of various endocrine glands, secretion and disorder organ & organ function test.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
<th>Title</th>
<th>Unit</th>
<th>Unit Content</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>V</td>
<td>DNA Replication</td>
<td>Unit 1</td>
<td>DNA Replication</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 2</td>
<td>Transcription</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 3</td>
<td>Translation &amp; Regulation of gene Expression</td>
</tr>
</tbody>
</table>

Course Outcome: Basic understanding DNA – its organization, Replication, Transcription and Translation berth in pro & Eukaryotes Inhibitors of Transcription & Translation. Concept of operon – Lac an inducible operon, Tryptophan operon it’s Attenuation.
<table>
<thead>
<tr>
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<th>Semester</th>
<th>Title</th>
<th>Unit</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO4</td>
<td>VI</td>
<td>Nutrition &amp; Immunology</td>
<td>Unit 1</td>
<td>Nutrition</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Balanced diet, RNA for children women. Malnutrition, Vitamins, minerals obesity &amp; starvation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 2</td>
<td>Immunology</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>Organization of Immune System Monoclonal Abs and their applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 3</td>
<td>Immunotechnology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Antigen &amp; AB interaction RIA, ELISA Vaccines Hypersensitivity reactions</td>
</tr>
</tbody>
</table>

Course Outcomes: Understanding the concept of Balanced diet, Importance of Vitamins & minerals organization of Immune System, various Immunotechniques, RIA, ELISA, and Various hypersensitivity reactions.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester</th>
<th>Title</th>
<th>Unit</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO4</td>
<td>VI</td>
<td>Microbiology &amp; r-DNA Technology</td>
<td>Unit 1</td>
<td>Microbiology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Introduction to history of microbiology. Bacterial growth curve, cultivations isolation of bacteria viral life cycles – T4, λ- Phages, TMV, Retroviruses - HIV</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 2</td>
<td>r-DNA – Technology</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maxim &amp; Gilberts and Sanger’s method of DNA sequencing cloning vectors, plasmids, cosmids &amp; λ-Phages. Molecular markers – RFLP, AFLP and RAPD</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Unit 3</td>
<td>r-DNA – Technology II</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Construction of “C”-DNA libraries, PCR, Blotting techniques’. production of human</td>
</tr>
</tbody>
</table>
Course Outcomes: Understanding of Prokaryotic cell, Growth curve, viral life cycles, T4, λ-Phages, TMV, HIV Maxim & Gilberts method of DNA sequencing, construction of “C”-DNA library, Blotting techniques Application of Bt- production of growth hormone, Bt-Cotton.
<table>
<thead>
<tr>
<th>UNIT</th>
<th>TOPIC</th>
<th>ASSESSMENT BASICS</th>
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<th>EXAMPLE</th>
<th>ASSESSMENT PERFORMANCE</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Compute fundamentals, strategy for designing algorithms, structured programming concepts, Basics of C</td>
<td>Basics of computer, memory hierarchy, operating system and overview of C program</td>
<td>Engaging the students in concept of life with visual and practical learning experiences</td>
<td>MS-office packages</td>
<td>Questioning the students by gamification methods</td>
<td>Can be able to write a program, save and open it</td>
</tr>
<tr>
<td>2</td>
<td>Input-Output Functions</td>
<td>Control statements, Arrays Strings and operators</td>
<td>Encouraging the students to prepare for the previous topic before the new topic starts</td>
<td>Bill-payment systems</td>
<td>Conducting seminar</td>
<td>IO Functions are used to read and display the data in the memory</td>
</tr>
<tr>
<td>3</td>
<td>Functions</td>
<td>Call-by-value and call-by-reference, storage classes, Recursion and pointers in C</td>
<td>Implementing the concept of functions by conducting instant exam</td>
<td>Retrieving data in different speeds from memory</td>
<td>Discussion Method by dividing the students into groups</td>
<td>Reduces the size of the code by duplicating set of statements are replaced by function calls</td>
</tr>
<tr>
<td>4</td>
<td>User-Defined Data Types and Files</td>
<td>Structures, unions, Enumerations in typing and file management Functions</td>
<td>Helping the students to understand how the previous topics applies to the current topic</td>
<td>Generating bills in the shopping mall (different products)</td>
<td>Conducting quiz</td>
<td>Efficient use of memory Difference functions of files can be retrieved effectively</td>
</tr>
</tbody>
</table>

Course outcome: The purpose of this topic is to introduce to students in the field of programming language. The students will be able to enhance their analyzing and problem-solving skills.
## PROGRAM OUTCOMES

**B.Sc I YEAR II SEMESTER-PROGRAMMING IN C++**

<table>
<thead>
<tr>
<th>UNIT</th>
<th>TOPIC</th>
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<th>ASSESSMENT PERFORMANCE</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Applications, Functions, Structures</td>
<td>Tokens, Data types Operators, Inline functions and references.</td>
<td>Bringing the academic concepts of life with visual and practical learning experiences.</td>
<td>Dynamic memory Management</td>
<td>Questioning the students by gamification methods</td>
<td>Can be able to write a program, save and open it.</td>
</tr>
<tr>
<td>2</td>
<td>Classes, Constructors, Member functions, Object</td>
<td>Instance class, Member function, overloading, Friend class.</td>
<td>Encouraging the students to prepare for the previous topic before the new topic starts.</td>
<td>Developing Hardware systems</td>
<td>Conducting seminar</td>
<td>I/O Methods are used to read and display the data in the memory. Creations of objects.</td>
</tr>
<tr>
<td>3</td>
<td>Inheritance, Polymorphism, Virtual Functions</td>
<td>Protected, private, public, Class, Base and abstract class.</td>
<td>Implementing the concept of functions by conducting instant exam.</td>
<td>Developing Games</td>
<td>Discussion Method by dividing the students into groups</td>
<td>Less code and maintenance upgrades, and good clean code.</td>
</tr>
<tr>
<td>4</td>
<td>Exceptions, Templates</td>
<td>Exception handling, throwing, class templates</td>
<td>Helping the students to understand how the previous topics apply to the current topic.</td>
<td>Manufacturing Embedded and Military Applications</td>
<td>Conducting quiz</td>
<td>Errors and Abnormalities to design, implement generic classes.</td>
</tr>
</tbody>
</table>

**Course outcome:** The purpose of this topic is to introduce students to the field of programming language. The students will be able to enhance their analyzing and problem-solving skills.
<table>
<thead>
<tr>
<th>S. NO.</th>
<th>TOPIC</th>
<th>ASSESSMENT BASICS</th>
<th>TEACHING STRATEGIES</th>
<th>EXAMPLE</th>
<th>ASSESS STUDENT PERFORMANCE</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unit- I Fundamental Concepts of D.S</td>
<td>Abstract Data Type, Basic Operations, Analysis of Algorithm</td>
<td>Evaluation of Flow Chart, Pseudo-code, Algorithm</td>
<td>Sequential Organisation, Library stack of Books</td>
<td>Questionnaire to the students by giving real world examples.</td>
<td>Solve problems computationally through the application of fundamental data structures and algorithms.</td>
</tr>
<tr>
<td>2</td>
<td>Unit- II Stack, Queues, Linked list</td>
<td>To overcome drawbacks of Arrays</td>
<td>Types, Operations and Algorithms</td>
<td>LIFO, FIFO, Storage and Retrieval</td>
<td>Seminar</td>
<td>Dynamic memory allocation.</td>
</tr>
<tr>
<td>3</td>
<td>Unit- III Trees and Graphs, Hashing</td>
<td>to find shortest path and store the data in hierarchical manners, Hash methods</td>
<td>Traversal and Hashing Techniques</td>
<td>Inheriting properties from parent to child, to find Route Map, Joint Account in a Bank</td>
<td>Board test on Traversal Techniques</td>
<td>Used as Navigating Technique, Presenting the information with ease, storing the data efficiently without collision.</td>
</tr>
<tr>
<td>4</td>
<td>Unit- IV Sorting and Heaps</td>
<td>Internal and External Sorts</td>
<td>Divide and conquer, Sorting Techniques-comparing with best and worst cases</td>
<td>Arranging and filtering the data. Online shopping</td>
<td>Quiz</td>
<td>Ad-hoc finding smallest and largest elements.</td>
</tr>
</tbody>
</table>

B.Sc. Sem-2 DATA STRUCTURES

PROGRAM OUTCOMES
<table>
<thead>
<tr>
<th>S. NO.</th>
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<th>ASSESSMENT</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unit-I Introduction to Databases</td>
<td>Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment</td>
<td>Bringing the academic concepts of life with visual and practical learning experiences</td>
<td>File system and using computer system</td>
<td>Questioner to the students by giving real-world examples</td>
<td>DBMS has evolved from a specialized computer application to a central component of a modern computing environment</td>
</tr>
<tr>
<td>2</td>
<td>Unit-II SQL &amp; Advanced SQL</td>
<td>Data manipulation, Simple Queries, Sorting Results, Using the SQL and PL-SQL</td>
<td>Encouraging the students to prepare for the previous topic before the new topic starts</td>
<td>creating and editing tables</td>
<td>Seminar</td>
<td>These concepts include aspects of database design, database languages and database-system implementation.</td>
</tr>
<tr>
<td>3</td>
<td>Unit-III Entity Relationship Modeling</td>
<td>Entity Types, Relationship Types, Attributes, Keys, Strong and Weak Entity</td>
<td>Implementing the concept of functions by conducting instant exam.</td>
<td>Identifying the repeated data, Data isolation</td>
<td>Board test on Traversal Techniques</td>
<td>The ERM provides high-level view issues in database design and encounter in capturing the semantics of realistic applications.</td>
</tr>
<tr>
<td>4</td>
<td>Unit-IV Transaction Management</td>
<td>Transaction Support - Properties of Transactions, Database Architecture, Concurrency Control and Database Security - Threats</td>
<td>Helping the students to understand how the previous topics applies to the current topic</td>
<td>Sampling data using polling system etc.</td>
<td>Quiz</td>
<td>In this, it focuses on the fundamentals of a transaction-processing system: Atomicity, consistency, isolation, and durability.</td>
</tr>
</tbody>
</table>

Course Outcome:
Students have a broad understanding of database concepts and database management system software.
They have a high-level understanding of major DBMS components and their functions.
They are able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schema based on the conceptual model.
## PROGRAM OUTCOMES
**B.Sc. Sem-V PROGRAMMING IN JAVA**

<table>
<thead>
<tr>
<th>Unit</th>
<th>TOPIC</th>
<th>ASSESSMENT BASICS</th>
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<th>ASSESS STUDENT PERFORMANCE</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction: Java Essentials</td>
<td>Classes, Objects, Inheritance</td>
<td>Evaluation of Basic Terms, Methods and Bringing with Visual and Practical Learning</td>
<td>Mobile Properties:TCP/IP,Process or:Methods:Send,Receive, SendEmail</td>
<td>Questionnaire to the students by giving real-world examples.</td>
<td>Solve problems computationally through the application of fundamental concepts and able to write a Java program.</td>
</tr>
<tr>
<td>2</td>
<td>Packages, Exception Handling, I/O Streams</td>
<td>Group of classes, interfaces and Multithreading</td>
<td>Reusability, Better Organization, Implementing of designs</td>
<td>Railway Reservations, Multiple A/C Holders Calculator</td>
<td>Seminar/Quiz</td>
<td>Memory gaining methods, implement packages</td>
</tr>
<tr>
<td>3</td>
<td>Applets, Event Handling, JDBC, Swing</td>
<td>Life cycle of Applets, AWT Components, Database Connectivity to Java</td>
<td>Generating, Connection to software tools and help them for project development.</td>
<td>Java Map grabbing weather through Mobiles, Movie Tickets</td>
<td>Group Discussion to Develop Software Tools</td>
<td>Design and analysis of Patterns and Apps development</td>
</tr>
</tbody>
</table>

**Course Outcome:** Students develop knowledge of basic Java to write simple programs for Calculator; Gain Expertise in Java Collections, MultiThreading, Exception Handling develop knowledge of applications of Java to enhance and analyzing implement small Gaming examples. Students implement projects/Apps requiring the implementation at Architect Level, Web-based applications, Android, Domains, Map Routing, etc.
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Software Engineering Process, Requirements, Specifications</td>
<td>Requirement gathering and analysis, Design, Implementation, Coding, Testing, Deployment, Maintenance</td>
<td>Visualization, Cooperating learning, Technology in the classroom</td>
<td>To generate e-ticket railway system</td>
<td>Generalizing the code, validating, checking the progress</td>
<td>Software Development and Maintenance</td>
</tr>
<tr>
<td>II</td>
<td>Architectural Styles, Object-Oriented Analysis, Desig n, UML</td>
<td>Presentation, business and database, Software Design Method, Class and Use diagrams</td>
<td>Discussion Method, Objectives, Content Methods and Evaluation</td>
<td>Online data work, Business development</td>
<td>Questions, Discussions, Observations, Examinations, and Assignments</td>
<td>To develop software design methods</td>
</tr>
<tr>
<td>III</td>
<td>Software Development, Testing and Assessing</td>
<td>Code reusability, Verification, Validation, Testing, Assessing Software Quality</td>
<td>Flipped classroom, Design Thinking, Self-Learning</td>
<td>Software Development</td>
<td>To verbalize their knowledge, select and present samples of their learning</td>
<td>Building quality software within stipulated time and budget is quite challenging</td>
</tr>
</tbody>
</table>

Course outcomes: Most methodologies share some combination of the following stages of software development: Analyzing the problem, Market
<table>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Introduction to computer networks, Transmission Media, Multiplexing</td>
<td>Data communication components, Topologies, Categories of Networks and ISO and TCP/IP Reference Model</td>
<td>Bringing the academic concepts of life with visual and practical learning experiences.</td>
<td>Many communication devices works based on this networking concepts, Ex: Telephone, Mobiles and Media</td>
<td>Questioning the students by gamification methods</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Data Link Layer, Local Area Networks and Switching</td>
<td>Error Detection, Error Correction and Error Control Techniques</td>
<td>Interacting with the students on this topic by practice session of taking examples on the error detection techniques</td>
<td>Categorising the Networks and their bounds and its speed, Ex: Wi-Fi, Cable TV Connection and Internet</td>
<td>Discussion Method by dividing the students into groups</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Networking and Internetworking Devices</td>
<td>Routing Algorithms, Repeaters, Bridges, Gateways, Bridges and Switches</td>
<td>Explaining with many examples of taking different routing tables and its efficiency</td>
<td>Finding the best way to transmit data in networks with accuracy and speed, Ex: Google Maps</td>
<td>Alloting the assignments for students on few topics with live examples</td>
</tr>
</tbody>
</table>

**COURSE OUTCOME:** The study of Computer Networks can be applied in various fields like home applications, person-to-person communication, interactive entertainment, etc. The Network is a communication link that interconnects a set of devices such as printers, computers, and scanners with Computer Networks.
<table>
<thead>
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<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Structuring documents for the web</td>
<td>Link and Navigation, Images, Audio and Video, Tables, Forms, Frames</td>
<td>Visualization, Cooperating learning, Technology in the classroom</td>
<td>Time-table, Menu page of College, Images, Audio, Video</td>
<td>Generating the code, validating, check the progress</td>
<td>To develop Web Pages.</td>
</tr>
<tr>
<td>II</td>
<td>Cascading Stylesheets</td>
<td>CSS properties, Designing Pages, Typography, Navigation</td>
<td>Discussion Method, Objectives, Content, Methods and Evaluation</td>
<td>College Web Site</td>
<td>Questions, Discussions, Observations, Examinations and Assignments</td>
<td>Covers the creation of multipage websites using these technologies</td>
</tr>
<tr>
<td>III</td>
<td>Learning JavaScript</td>
<td>DOM, Built-in Objects, Working and Posting the site on the Web</td>
<td>Flipped classroom, Design Thinking, Self Learning</td>
<td>Events, Registration Form</td>
<td>To verbalize their knowledge, select and present samples of their learning.</td>
<td>Use a stand-alone FTP program to upload files to a web server, Completion of a multi-page web site.</td>
</tr>
</tbody>
</table>

Course Outcomes: Introduces HTML using an HTML editor, includes web terminology, HTML 5, uploading pages to a server (FTP), site management, links, lists, tables, forms, video, frames, working with graphics, and accessibility. Introduces stylesheets (CSS) and responsive (mobile) web design. Covers the creation of multipage websites using these technologies.
PROGRAM OUTCOMES
B.Sc Mathematics

DIFFERENTIAL CALCULUS (PAPER 1):
Exposing students to some basic notions in differential and integral calculus.

DIFFERENTIAL EQUATIONS (PAPER 2):
To introduce the students to the techniques of solving differential equations and to train to apply their skills in solving some of the problems of engineering and science.

REAL ANALYSIS (PAPER 3):
Exposing the students to the foundations of analysis which will be useful in understanding various physical phenomena.

ALGEBRA (PAPER 4):
Exposing the students to learn some basic algebraic structures like groups, rings etc.

SOLID GEOMETRY (PAPER 5):
Students learn to describe some of the surfaces by using analytical geometry and understand the beautiful interplay between algebra and geometry.

LINEAR ALGEBRA (PAPER 6):
Students are exposed to various concepts like vector spaces, bases, dimension, Eigen values etc.

NUMERICAL ANALYSIS (PAPER 7):
Students will be made to understand some methods of numerical analysis.

VECTOR CALCULUS (PAPER 8):
Concepts like gradient, divergence, curl and their physical relevance will be taught.

NUMBER THEORY (SEC):
Students will be exposed to some of the jewels like Fermat’s theorem, Euler’s theorem in number theory.
Mission and Vision of the Department

Mission :-

We seek to provide high quality, innovative and flexible teaching and learning opportunities in a learning – centered environment.

Vision :-

We provide excellence, innovation and success in education to inspire & transform lives in communities.
Microbiology Department Programme Outcomes

Name of the Programme :- BMC & ZMC

BMC :-

➢ Microbiologist who has knowledge of botany can have the subject knowledge about what are the different microbes which are useful or harmful to the plants and how to increase or decrease their effects on plants without using artificial chemicals.

➢ Students can also have the information about how to produce the different useful products from plants using microbes and also know about the different chemical reactions occurring in plants and microbes during their survival as well as processing.

➢ Microbiologist can analyze the profile of soil and increase the fertility of soil which increase plant growth.

ZMC :-

➢ Students who pot combination of Zoology, Microbiology and Chemistry can have the knowledge about the different microbes causing different disease, diagnosing them & treating them in both humans & animals.

➢ Production of various drugs by using microbes and their effect in different animals in different species and the type of reaction it undergoes can be known.

➢ Students since they have grip on chemistry they can go for their further students and research in pharmaceutical microbiology where production of different products and chemical changes occurring in them is studied.
Programme Specific Outcomes

Name of the Programme: Specialization – Microbiology.

- Microbiology is the study of microorganisms
- Microbiology overlaps with various courses/areas of biology like molecular biology, genetics & immunology.
- Scope of microbiology is huge because of the involvement of microbiology in various fields such as pharmacy, medicine, clinical research, agriculture, dairy industry, water industry, medical transcription, nanotechnology & chemical technology.
- Microbiologist role is to ensure developing green technologies, treating and preventing disease or tracking the role of microbes in the climate change.
- The graduate students of microbiology can go for their further studies for post graduate level in microbiology.
- In P.G level specialization in microbiology like Industrial microbiology, cellular microbiology, soil microbiology, microbial genetics, Agriculture microbiology, Medical microbiology etc are available.
- Further students can go into the research field where new discoveries in the field of science is taking place.
- Academics: They can go as a professor in microbiology after completion of M.Sc.
- They can also get good opportunity as microbiologist in Hospitals and Labs.
Microbiology Department  Course Outcomes

Name of the Programme :- Paper I, Sem I – General Microbiology – I

Co₁↔ History of Microbiology :-
   — Known the contributions of different scientist in the field of Microbiology
   — Importance & Application of Microbiology in Agriculture, Industries, Medicines, Pharmaceutical fields etc.

Co₂↔ Microscopy :-
   — To Known & study different instruments, techniques used to view different micro objects and microorganisms.

Co₃↔ Biology of M.O’s :-
   — Study about different classification of microorganisms by different scientist.

Co₄↔ Structure of Microorganisms :-
   — Knowledge of different structures and components of different microorganisms.

Name of the Programme :- Sem II – General Microbiology – II

Co₁↔ Microbiological techniques :-
   — They can get knowledge about different sterilization techniques.

Co₂↔ Pure Culture techniques :-
   — Know about different isolation techniques to get pure cultures.

Co₃↔ Biomolecules :-
   — Study about structure, characteristics and classification of different biomolecules like carbohydrates, Lipids, Nitrogen bases.
Co₄ ➔ Biochemical techniques:-
    — They can get knowledge about different techniques used for separation of mixture of biomolecules.

Name of the Programme :-  Sem III – Microbial physiology & Enzymology.

Co₁ ➔ Microbial nutrition and photosynthesis :-
    — Study about different types of nutrients uptake & photosynthesis.

Co₂ ➔ Microbial growth :-
    — Study about different media’s used for micro organisms growth and measurement of microorganisms.

Co₃ ➔ Microbial Metabolism :-
    — Information about different metabolic pathways & fermentations can be studied.

Co₄ ➔ Enzymes :-
    — It is a study of enzymes used in different reactions & their classification, reactions carrying in metabolic pathways.

Name of the Programme :-  Sem III – Sec:- Hematology.

Co₁ ➔ To study about blood & its components, complete blood picture, normal and abnormal conditions.

Co₂ ➔ Get the knowledge about blood transfusion & its preservation, Blood diseases.
Name of the Programme: Sem IV – Microbial Genetics and Molecular biology.

Co₁ ↔ Microbial Genetics :-
   — Knowledge about what is the genetic material and how it is transferred from one generation to another generation – basis of their transfer.

Co₂ ↔ Mutations :-
   — How do changes occurs in the gene and how the genes are transferred.

Co₃ ↔ Gene Expression :-
   — By this unit, knowledge about how the information present on the gene can be expressed is known.

Co₄ ↔ Recombinant DNA technology :-
   — How the genetic material of different varieties is combined and how and where this is used in different fields like Agriculture, medicine, pharmacy, environment, etc.

Name of the Programme: Sem IV – Food Adulteration.

Co₁ ↔ Information about types, causes of food adulterants is known.

Co₂ ↔ Effects, prevention of food adulteration is known.

Name of the Programme: Sem V – Applied Microbiology.

Co₁ ↔ Microbes in Agriculture :-
   — Information about different microbes (useful) present in soil are studied.
   — Microbes used as biofertilizers is also studied.

Co₂ ↔ Plant Diseases & Bio control :-
   — Different diseases in plant caused by different microbes and how it can be controlled by using microbes is studied.
Co₃ ↔ **Microbial ecology** :-
   — Role played by different microbes in relation with environment and even other microbes is been studied.

Co₄ ↔ **Role of microbes in environmental pollution** :-
   — How different microbes are used in studing the environment pollution can be known.

**Name of the Programme** :- Sem V -(SEC) – Mushroom Cultivation.

Co₁ ↔ Importance and history of mushrooms which is an energy rich, protein rich food can be known.

Co₂ ↔ How to cultivate the useful mushrooms with more profit can be known.

**Name of the Programme** :- Sem V – **Immunology**.

Co₁ ↔ **History of Immunology and Immunity** :-
   — Different components and their involvement in developing immunity in the body can be known.

Co₂ ↔ **Cells and Organs of Immune system** :-
   — Different Organs, cells of our body, and involvement of them in our body in developing immunity can be studied.

Co₃ ↔ **Antigens and Antibody reaction** :-
   — Different reactions occurring in vivo and invitro to diagnose causative agent of particulars disease and also Naturally curing of the some disease/infections by our body can be studied.

Co₄ ↔ **Immunological processes and Applications** :-
   — How different antibodies can be used in curing the disease i.e production of vaccines.
Name of the Programme: **Sem VI – Medical Microbiology.**

Co₁ → **Medical microbiology:**
- How the different microbes present on & in our body acts naturally against the pathogens.

Co₂ → **Diagnostic & Therapeutical Microbiology:**
- Information regarding collection, preservation, processing of different clinical samples to diagnose different disease can be known.

Co₃ → **Medical Bacteriology:**
- From this different bacteria causing different disease are been studied.

Co₄ → **Medical virology and parasitology:**
- Different viruses & parasites causing different disease can be known.

Name of the Programme: **Sem VI – Industrial Microbiology.**

Co₁: What are the different industrially useful microbes for the production of different products and where and how can we get those useful microbes is known.

Co₂: Different types of instruments used/types of production of various substances like alcohol, beverages, Antibiotics, Aminoacids, Biofuels, Organic acids, vitamins, etc are studied.

Co₃: Different media and raw materials used in industries for the growth of respective microbes, production of the useful products by using those microbes and how the process is carried out is known.

Co₄: From this they study the production of different industrial products by using the complete procedure of the steps for its production.
- Products like ethanol, beverages, Antibiotics, Vitamins, etc production can be studied.
SAROJINI NAIDU VANITA MAHA VIDYALAYA
DEPARTMENT OF CHEMISTRY

PROGRAMME OUTCOMES

Name of the programme: M.Sc.

- To provide students with the ability to plan and carry out experiments independently and assess the significance of outcomes.
- Specialized Knowledge in the field.
- Career advancement
- Increased earning Potential
- With a masters degree in chemistry job opportunity exist both in the private sector, research institution, pharmacy and other industries.
- Students also develop valuable personal skills and fulfill a crucial prerequisite to Ph.D. study.

PROGRAMME SPECIFIC OUTCOMES

Name of the Department: Chemistry

Name of the programme: M.Sc. Organic Chemistry

- Organic Chemistry is important for students intending to become chemist and is involved in cross disciplined work with Life Sciences, Biotechnology and Engineering.
- Develop an understanding of chemistry of carbon based compounds.
- Develop an expertise relevant to professional practice of chemist.
- Develop skills in procedures and spectroscopic methods applied in analytically and synthetic task of organic chemistry.
- Experience in some scientific methods employed in organic chemistry.
COURSE OUTCOMES

Semester- I

Paper-1 Inorganic Chemistry

Symmetry of molecules:
- Knowledge of symmetry gives us power of prediction. As a result we use symmetry in decision making process of virtually every task we perform.
- Symmetry is very useful in day to day life.
- Able to recognize the symmetry elements and their symmetry operations.

Bonding in metal complexes:
- Several metal complexes have many interesting properties in many aspects of human life.
- A huge number of metal complexes are used as catalyst in variety of organic reactions. For example: Polymerization, Hydrogenation.
- Several metal complexes are in clinical use for the treatment of various diseases one such example is cisplatin. It is most successful example for the treatment of cancer

Coordination Equilibria:
- The metal ligand interaction in equilibria is used for determination of stability constant values and factors affecting the stability constant values. Example: Nature of ligand, Nature of metal.
- It has wide applications in the use of Spectrophotometry, polarography, p^H metry for determining the trends in stability constant values.

Ligational aspects of diatomic molecules:
- Metal carbonyls are useful in the organic synthesis and as catalyst in homogenous catalysis as hydroformylation.
- In organometallic chemistry metal carbonyls serves as precursors for preparation of other organometallic complexes. These are useful in industrial process for example extraction and purification of Nickel. Metal dinitrogen complexes are very useful in the fixation of dinitrogen.

Paper-II Organic Chemistry

Stereochemistry:
• Stereochemistry is 3D chemistry. It is a field that has often been especially challenging for students because of difficulty in visualizing 3D objects, given 2D representation on paper.
• Physical models and 3D computer models can be of great help and the student is encouraged to use them to understand the stereochemistry. It has significance in Pharmaceutical industries.
• Food and Drug Administration (FDA) requires the drug be produced in enantiomerically pure form, for which understanding the stereochemistry of drug molecule is essential.

Reaction Mechanism:

• A reaction mechanism can be simply defined as the detailed, step-by-step description of the pathway by which reactants are converted into products.
• The study of detailed process of reaction mechanism is important for many reasons; including the help it gives in understanding and controlling chemical reactions.
• There are several reaction mechanisms which describes chemical transformations occurring in the atmosphere.

Conformational Analysis:

• Conformational analysis is an indispensable tool for elucidation of the properties and the behavior of organic molecules.
• It is a comparatively new area of organic chemistry that has been well developed after the theory of organic reactions, bonding in organic compounds and stereochemistry.
• Conformational analysis plays a fundamental role in various research fields of organic chemistry.

Natural Products & Heterocyclic Compounds:

• Natural products have high structural diversity and unique pharmacological or biological activities.
• It covers the field of herbal medicine, organic chemistry and pharmaceutical science. It plays a critical role in the identification of numerous medicines.
• Natural products are the inspiration of approximately half of US FDA approved drugs.
• Heterocyclic compounds are of very much interest in our daily life, they have a wide range of applications. They are predominantly used as pharmaceuticals, as agrochemicals and as veterinary products. Some of the natural products eg: antibiotics such as pencillin, cephalosporin and few alkaloids have heterocyclic moiety.
• In pharmaceutical industries over 75% of the top 200 branded drugs have heterocyclic fragments in their structure.
Thermodynamics:

- The heat changes during the chemical reaction can be known efficiency (working capacity) of all machines can be known.

Chemical kinetics:

- It relates to many aspects of cosmology, geology, biology, and engineering psychology for reacting implication.
- Refrigerator is real life application for chemical kinetics a refrigerator lowers the temperature of the reactants therefore slowing down the reaction of food rotting because with the lower temperatures the rate of the reaction decreases.
- One more example enzymes several enzymes in a human stomach that allows the activation energy to be lowered therefore this allows the body to digest food in an efficient manner.

Electrochemistry:

- It deals with the interconversion of electrical energy & chemical energy. The principles of cells are used to make electrical batteries. In science and technology a battery is a device that stores chemical energy and makes it available in an electrical form

Quantum chemistry:

- Quantum theory include quantum chemistry, quantum optics, quantum computing, super conducting magnet, light emitting diode & the laser transistor and semi conductors such as micro processor medical and research imaging.
- Today the most precious clocks in the world atomic clocks are able to use the principle of quantum theory to measure time such super sensitive atomic clocks help with GPS navigation ,telecommunication, surveying.

Paper-IV Analytical techniques and spectroscopy-I

Techniques of chromatography:

- Chromatography techniques are very useful in the separation of different samples mainly organic samples.
- Chromatography can be used in flavor studies and to detect spoilage in foods such as additive detection, determining nutritional quality, crime sense testing, forensic pathology metabolomics and proteomics and nucleic acid research. These are useful in the quantification methods for the analysis of hydrocarbons in a given mixture

NMR-Spectroscopy-I:
NMR spectroscopy is widely used to determine the structure of organic molecules in solution and study of molecular physics, crystals as well as non crystalline materials. NMR is also routinely used in advance medical imaging techniques such as magnetic resonance imaging (MRI)

**Rotational and Vibrational spectroscopy:**
- Rotational spectroscopy is primarily used in investigation of molecular physics. It is a unique precise tool to determine molecular structure in gas phase.
- Vibrational spectroscopy is used for the identification of functional groups, structural determination of organic compounds, used in pharmaceutical research.

**Electronic spectroscopy:**
- Electronic spectroscopy is related to uv-visible radiation. Electronic spectroscopy is widely used to detect environmental samples.
- It is an analytical technique to study electronic structure and its experimental applications include high resolution measurements on the intensity and angular distribution of emitted electrons.

**Practicals**

**Paper- V: Inorganic Chemistry:**
- Able to estimate the amount of metal ion in given solutions.
- Gain knowledge to synthesize complexes of different shapes.

**Paper- VI: Organic Chemistry:**
- To get expertise in synthesizing various organic compounds independently.
- Gains knowledge of checking the physical constant and purification of organic compounds by recrystalization method.

**Paper- VII: Physical Chemistry:**
- Able to perform experiments individually and gain knowledge about principles and techniques involved in various experiments.
- Acquire hands on experience on handling instruments.
Semester- II

Paper-1 Inorganic Chemistry

Reaction mechanism of transition metal complexes:

- It has an important research application in the metallurgical industry and is of interest in the science of biochemistry, biology, organic, inorganic and bioinorganic chemistry.
- A huge number of metal complexes are used as catalyst in variety of organic reactions example: polymerization, hydrogenation, addition etc.

Bonding in metal complexes-II:

- Several metal complexes have many interesting properties in many aspects of human life.
- A huge number of metal complexes are used as catalyst in variety of organic reactions. For example: Polymerization, Hydrogenation. Several metal complexes are in clinical use for the treatment of various diseases one such example is cisplatin. It is most successful example for the treatment of cancer.

Metal clusters:

- Metal clusters are very interesting materials with highly active metal sites.
- We have presented the collection of metal clusters having potential for the treatment of different of fatal diseases like cancer, diabetics, alzheimers, cardiovascular disease, hypertension and anemia etc. thus, the metal clusters are now getting prominal share in modern medicines.

Biocoordination chemistry:

- Biocoordination chemistry is a field that examines the role of metals in biology.
- Biocoordination chemistry includes the study of both natural phenomena such as the behaviour of metalloprotiens as well as artificially introduced methods including those that are non essential, medicine and toxicology.

Paper-II Organic Chemistry

Reaction Mechanism II:

- To understand the mechanism of nucleophile aromatic, aliphatic electrophile substitution reaction and effect of different neighboring groups participation on rate of reaction.
- Neighboring group’s participation plays a vital role in various research fields of organic chemistry.
Percyclic Reaction:

- Pericyclic chemistry is a promising and creative route to various biologically significant five and six membered oxygen or nitrogen ring system.
- To predict the pericyclic reactions by considering the symmetry molecular orbitals of the system.
- To develop interest and understanding of the theoretical basis for per cyclic reaction and skills for the utilization in organic synthesis.
- Percyclic reactions are usually rearrangement reactions. It helps to predict stereochemistry and products of the per cyclic reactions.

Photochemistry:

- To predict the base concept for understanding various photochemical reactions.
- To study the synthetic possibility of photochemical reactions to get the target compound.
- To predict synthesis and application of various photochemical reactions.

Reactive Intermediates and molecular rearrangement:

- To study the generation, stability and reactive intermediate in various named reaction.
- To identify the intermediate formed in given reaction and able to predict the mechanism for molecular rearrangement.
- To understand the key concepts in organic chemistry and to prepare students for solving advanced research problems in organic chemistry.

Paper-III Physical chemistry

Thermodynamics-II & Statistical thermodynamics:

- The heat changes during the chemical reaction can be known efficiency (working capacity) of all machines can be known. Example: all vehicles cars, motorcycles, trucks, ships, aeroplanes, all refrigerators, all types of air and gas compressors.

Photochemistry-I:

- It has an important application in uv-curable paints, primers and printing inks. Photo stabilizers are primarily used in plastics and man-made fibers. Active ingredients, the investigations of photochemical smog formation and the development of photo degradable plastics.

Quantum chemistry:
• Quantum theory include quantum chemistry, quantum optics, quantum computing, superconductor magnet, light emitting diode & the laser transistor and semi conductors such as micro processor medical and research imaging.
• Today the most precious clocks in the world atomic clocks are able to use the principle of quantum theory to measure time such super sensitive atomic clocks help with GPS navigation, telecommunication, surveying.

Solid state chemistry:
• It has an important applications of X-ray diffraction, principles of inorganic crystal structures, crystal chemistry and bonding in solids, phase diagram of 1,2,3 component system.
• It is used in the field of mineralogy, crystallography, ceramics, metallurgy, thermodynamics, material science and electronics with a focus on the synthesis of novel materials.

Paper-IV Analytical techniques and spectroscopy-II

Electro and thermal analytical techniques:
• Electro analytical methods are a class of techniques in analytical chemistry which study an analyte by measuring the potential and current in electrochemical cell containing the analyte.
• Electro analytical method has been applied to the characterisation and study of complexing properties of several Cd, Zn and metallothioneins of different mammalian origin.

NMR-Spectroscopy-II:
• NMR spectroscopy is widely used to determine the structure of organic molecules in solution and study of molecular physics, crystals as well as non crystalline materials.
• NMR is also routinely used in advance medical imaging techniques such as magnetic resonance imaging (MRI)

Mass spectrometry:
• Mass spectrometry is a powerful analytical tool with many applications in pharmaceutical and biomedical field.
• It is also used as sensitive detector for chromatographic techniques like LC-MS, GC-MS. Specific applications mass spectrometry includes drug testing and discovery, food contamination detection, pesticide residue analysis, protein identification, finger printing and carbon dating.
Photoelectron & ESR spectroscopy:

- PES is a technique used for determining the ionization potentials of molecules. The application of X-ray photoelectron spectroscopy (ESCA) to the study of fiber glass surfaces is reported.
- ESR measurements reveal applications in medicine, biology, pharmacy, cosmetology, biotechnology. It is a useful method for the examination of tissues, cells, biopolymers, drugs, cosmetic substances and biomaterials. It is also useful in ophthalmology.

Practicals

Paper- V: Inorganic Chemistry:

- Able to estimate the metal ion by using various analytical methods and get knowledge about principles and techniques involved in the experiments.

Paper- VI: Organic Chemistry:

- Gain knowledge of handling laboratory equipments.
- Able to identify functional group present in given organic compounds.
- Able to Interpret of the structure of organic compounds by IR, UV, $^1$HNMR and Mass spectral data.

Paper- VII: Physical Chemistry:

- Gain knowledge in prediction and verification of experimental results by graphical methods.
Semester-III

Paper- I Synthetic Reagents, Advanced NMR, Conformational Analysis & ORD

Synthetic Reagents:

- Synthetic reagents consist of a broad range of chemicals with many uses in chemical synthesis. They are the key components used for transforming functional groups.
- There are specialized reagents which can be used in trace amounts instead of using large quantities.
- In research, synthetic reagents are used as a catalyst and intermediate in different reactions. Many organic compounds have been synthesized using a variety of synthetic reagents.

Advanced NMR- $^{13}$C NMR & 2D NMR:

- $^{13}$C NMR is an important tool in chemical structure elucidation in organic chemistry. It is a noninvasive and non destructive method i.e. especially used in repetitive invivo analysis of the sample without harming tissue.
- $^{13}$C NMR of biological materials allows for the assessment of the metabolism of carbon, which is so elementary to life on earth.
- 2D NMR is one of the emerging analytical techniques being used more and more in the pharmaceutical and chemical industries.
- In order to fully prepare students for future jobs in industry, it is important to educate students about 2D NMR.

Conformational analysis (Cyclic system) & ORD:

- Conformational analysis of medium and large rings is important as they are present in numerous natural products and pharmacologically active products. Thus, not only thoroughly understanding but also an ability to apply conformational analysis to comprehend biological properties of organic compounds and interaction in complex system.
- ORD can be used to find absolute configuration of metal complex and other organic compounds. It also determines optically active substance and stereochemistry of aminoacids and steroids. It is widely used in the structure determination of polypeptides.

Paper-II Modern Organic Synthesis

Asymmetric Synthesis:

- It is one of the important topics of research which completely deals for the development of technology, for production of high value pharmaceuticals and agrochemicals.
Synthetic Strategies and Synthetic reaction:

- It involves the design and control of stereochemistry. It focuses on developing key skills in making complicated organic molecules from simple building blocks and transforming one organic molecule to another using the synthetic strategy.
- The concept of retro synthetic analysis is a logic based tool that uses pattern recognition and mechanistic understanding for the design of synthetic pathway. Students will be trained in modern synthetic methodology.

Paper-III Bioorganic Chemistry

- Bioorganic chemistry develops an advanced understanding of the structure and functions of natural organic molecules or compounds.
- Bioorganic chemistry is chemistry at the interface of organic and biological chemistry and involves the design, synthesis and evaluation of substrate, probes and materials for the study of biological systems and principles.
- It involves the study of biological process using chemical methods. Organic chemistry methods are used to synthesize biological molecule and to examine their structure, to investigate biochemical reactions.

Paper-IV Green Chemistry & Organic Materials

Green Chemistry:

- Green chemistry is the new and rapid emerging branch of chemistry. The beginning of green chemistry is considered as a response to the need to reduce the damage of the environment by manmade materials and the process used to produce them.
- It includes anything from producing waste to even disposing of waste in the correct manner. Success of green chemistry depends on the training and education of new generation of chemist. Students at all levels have to be introduced to the philosophy and practice of green chemistry.

Supramolecular Chemistry:

- It is important for the development of new pharmaceutical therapies by understanding the interaction at a drug binding site.

Nanochemistry:

- It is the combination of chemistry and nanoscience. One highly researched application of nanochemistry is medicine eg: Simple skin care product using the technology of nanochemistry is sunscreen.
Nanochemistry presents a blueprint for the future development of an existing teaching and research programme. Many nanotechnological methods and materials can be functionalized for drug delivery.

**Practicals**

**Paper- V: Synthesis of organic molecules and isolation of natural products and TLC:**
- Gets expertise to synthesis various organic compounds.
- Able to handle laboratory equipment like steam distillation.
- Able to check the purity of organic compound and the progress of reaction by performing TLC techniques individually.
- To provide knowledge for the isolation of natural products experimentally by various methods.

**Paper VI: Separation and identification of organic compounds and column chromatography**
- Able to separate the organic compounds by column chromatography.
- Helps in developing practical skills for the separation of organic mixtures.
Semester-IV

Paper- I Drug design and drug discovery

- To know about the discovery of drugs, its pharmacokinetics and pharmacodynamics action.
- To understand the relationship between structure and biological activity of drugs.
- To know the importance of physicochemical property for drug action.
- To understand the combinatorial approach on drug synthesis, structure determination.
- The aim of CADD is to cover a wide range of computational methods for discovery of new drugs with benefits like cost saving, insight knowledge of drug receptor interaction, speed up discovery and development.

Paper-II Drug synthesis and mechanism of action

- To study the synthesis of different drugs including chiral drugs.
- To understand the mechanism of action of different drugs acting on cell wall, DNA, immune system and ion channel.
- To know the mechanism of chiral drug action and their pharmacological activity.

Paper-III Advanced Heterocyclic Chemistry

- The course gives the quantitative ideas about the synthesis of heterocyclic compounds and its properties.
- Heterocyclic compounds are very interesting due to their distinct structure and the availability of heterocyclic ring in medicinal drugs.
- Heterocyclic compounds are important in the synthesis of different drugs.
- To predict various methods of ring synthesis, reactivity and its applications in heterocyclic chemistry.
- To apply the knowledge of heterocyclic chemistry in the development of drugs.

Paper- IV Advanced Natural Products

- Natural products provide a rich source for the therapeutic discovery and development of drugs.
- This course provided a brief introduction of the important classes of compounds from plant.
- A stress will be put on biosynthesis analysis of structure and pharmaceutical perspectives.
- It helps to analyze structures of natural products by using spectral methods.
- It also helps to gain knowledge in designing of synthesis of natural products.
Practicals:

**Paper V: Spectroscopic identification of organic compound and practice of chemistry software program**

- Able to interpret the structure of organic compounds by analyzing spectral data using advanced spectral techniques.
- Able to draw the chemical structure by using chemdraw.

**Paper VI: Synthesis and analysis of drugs**

- Gains knowledge in synthesizing the drugs and estimating the purity of drugs by using the techniques and principles of experiments.
Name of the Program: M.Sc., PHYSICS(ELECTRONICS AND INSTRUMENTATION)

Program Objective:

The Master of Science in Physics Program provides the candidates with knowledge, general competence, Analytical skills on an advanced level, needed in industry, Consultancy, Education, Research or Public administration. E and I specialization provides a brief knowledge of measurements and measuring Instruments, so that students gain sufficient information of measurements in any kind of industry viz. electrical, electronics, mechanical etc.

The candidate understands the role of physics in society and has the background to consider Ethical problems and the value of life long learning. Students gain the ability to successfully carry out advanced tasks and projects both independently and in collaboration with others or through PhD studies in physics.
M.Sc Physics Curriculum Objectives
Semester I

Paper I (Mathematical physics)

Unit I:
They identify Legendre’s, Bessel’s and associated differential equations and obtain there polynomials from generating function and Rodrigues formulae.

Unit II:
They identify Hermite and Lagueree differential equation and obtain the expression for Hermite and Lagueree polynomials and writing generating function of Hermite and laugueree differential equations.

Unit III:
They identify the properties of Fourier and Laplace transform, and to solve problems based on Fourier Transform and Laplace transform and finding inverse laplace of equation by convolution theorem.

Unit IV:
They come to know about matrix and tensor properties along with there difference.

Paper II (Classical mechanics)

Unit I
Students will be able to understand the true nature of Newtonian mechanics, Lorentz transformation equations, describe planar and spatial motion of rigid body.

Unit II
To understand the fundamental concepts in Lagrangian formulation of mechanics and to represent the equations of motion for complicated mechanical systems using it.

Unit III
To represent the equations of motion for complicated mechanical systems using Hamiltonian formulation of classical mechanics.

Unit IV
Students will be able to define and understand basic mechanical concepts related to discrete and continuous mechanical systems.

Paper III (Quantum mechanics)

Unit I
Student identifies correctly the mathematical space that contains all possible states of a physical system using Dirac’s notation.
Student computes the probability of finding the system in a given state given that it was prepared in another given state.

Unit II
Students computes the energy eigen values and evolution of the quantum simple harmonic oscillator and evolution of a particle in a box.

Unit III
Student finds the transmission and reflection coefficients for one dimensional barriers.

Unit IV
Student finds the commutation relations for linear angular momentum.

Paper IV (Solid state physics)

Unit I
Students gain basic knowledge of crystal systems and spatial symmetries, concepts like structure factor, and able to account for how crystalline materials are studied using diffraction.
Unit II
Students understand vibrational properties of solid state system, know what phonons are and be able to perform estimates of their dispersive and thermal properties.

Unit III
Students will be able to know Bloch’s theorem and about energy bands, fundamental principles of semiconductors and to estimate the charge carrier mobility and density.

Unit IV
Students will understand the various defects exits in the formation of crystals, color centers, how the macroscopic properties of solids result from their microscopic, atomic scale properties.

Semester II

Paper I (Electromagnetic theory)

Unit I
To familiarize the students with different concepts of electrostatic, magnetostatic and time varying electromagnetic systems. To analyze Maxwell’s equations in different forms and apply them to solve various electromagnetic field problems.

Unit II
Students are exposed to the ideas of plane em waves, their propagation in different media, power flow, polarization.

Unit III
Students gain knowledge about boundary conditions, plane em wave reflection and transmission at boundaries, Fresnel’s equations, metallic reflection and dispersion.

Unit IV
Students will be able to understand wave equations for potentials, retarded potentials, oscillating source and able to explain electric and magnetic dipole radiation, linear antenna.

Paper II (Statistical mechanics)

Unit I
Students will have basic idea of phase space, micro state, macro state and provides the idea of probability to the particles.

Unit II
Students have the insight of postulates of statistical physics and learn which particles follow which statistics and why.

Unit III
Students apply the statistical distribution in real life problem and understand their problem. Many real system of particles will be dealt throughout the course to relate the theoretical knowledge to practical one.

Unit IV
Students will be able to compute the fluctuation in the number of particles in the system at constant V and T.

Paper III (Quantum mechanics)

Unit I
Student is able to explain the Dirac equation and its free-particle solutions.

Unit II
Students will be able to know how to express observables in field theory in terms of annihilation and creation operators.

Unit III
Study the Stark effect, characters of hydrogen atom.
Unit IV
Study the wkB approximation method.

**Paper IV (Electronics)**

**Unit I:**
They come to know basic Analog Circuits and their Applications, To understand Basic construction of Feedback Circuits and their applications in Oscillators, to understand basic amplifier circuits and there applications in analog circuits

**Unit II:**
To understand basic function of OP-Amp ,Ideal and practical characteristics and their mathematical applications, they understand construction of Comparators and their applications in Electronics, they understood types of Multivibrators and Wave Form generators Using Ic 555

**Unit III:**
They come to know introduction of Flipflops, Registers, counters and Shift registers, at the end of course students be able to recognize and analyze basic logic circuits.

**Unit IV:**
To understand basic architecture of 8-bit microprocessor, able to write programs on 8085 microprocessor. Develop skills in assembly language programme

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**Semester III**

**Paper I (Modern optics)**

**Unit I**
Students will be able to understand principles involved in the interactions between light and matter, the requirements for a system to act as a laser.
Provides students a thorough understanding of fundamentals of lasers, their unique properties.

**Unit II**
To differentiate the various types of lasers and their means of excitation, assess which laser would best meet the need for a particular industrial or research task.

**Unit III**
Students will understand the fundamentals, techniques and applications of holography and Fourier optics.

**Unit IV**
To expose the students to fundamental concepts of non linear optics, second harmonic generation, self focusing of light, phase matching considerations.

**Paper II (Advanced solid state physics)**

**Unit I**
Students will be able to account for what Fermi surface is and how it can be measured, effect of electric and magnetic fields on it.

**Unit II**
To understand about dielectrics and to measure dielectric constant of a solid and their behavior, ferroelectric crystals classification, polarization.

**Unit III**
Students will understand magnetic properties of solids along with the theoretical methods of quantum mechanics, statistical mechanics.

**Unit IV**
Students gain knowledge about super conductivity, types of super conductors, concepts of high temperature super conductors and their applications which provides essential background for beginning research in condensed matter.
Paper III (Electronic Instrumentation)
In this paper Students are going to study,
Unit I
How the errors are occurring in measuring system and how to test the system performance by using different input signals.
Unit II
About concept of amplifiers & filters and their importance in instrument design.
Unit III
About various signal generators and spectrum analyzers. And also the types of distortions in the instrument.
Unit IV
The concept of different types of measuring and recording systems and also about displays.

Paper IV (Microprocessor, DSP and Interfacing)
In this paper Students are going to study,
Unit I
About architecture of 8086 microprocessor and how to interfacing various ICs to the microprocessor in system design and also how to write assembly language programs and run on 8086 based system.
Unit II
About how to interface various ICs to 8086 while designing 8086 microprocessor based systems. And also difference between 16-bit, 32-bit and also multi core processors and their architectures.
Unit III
About a special purpose DSP processor and its usage in day to day life.
Unit IV
About various addressing modes and Instructions of DSP processor.

Semester IV
Paper I (Nuclear physics)
Unit I
Students understand about nuclear forces and nuclear models using quantum mechanical theories.
Unit II
Students will be exposed to understand the theories of three types of radioactive decay (α, β, ν), nature of α, β spectra, multipole radiation.
Unit III
To compare the relative penetrating power of three types of nuclear radiation
To understand interaction of radiation with matter and energy loss mechanisms, identify and explain the general operation of gas-filled, scintillation and semi conductor detectors.
Unit IV
Helps students to learn about nuclear reactions, characteristics, fusion and fission reactions and information about nuclear structure.

Paper II (Spectroscopy)
Unit I:
Describes the atomic spectra of one and two valence electrons of atoms
Unit II:
Describes the Molecular Spectra and its salient features and explains Rotational Vibrational spectra of atoms.
Unit III:
Describe Raman and IR spectra and how Fourier principle used in spectrophotometer.

Unit IV:
Describe Electron spin and nuclear magnetic resonance spectroscopy and their applications.

**Paper III (INTRUMENTATION FOR MEASUREMENT, CONTROL, DATAACQUISITION AND DATA TRANSMISSION)**

In this paper Students are going to study,

**Unit I**
About concept of transducers and their usage in measuring physical parameters.

**Unit II**
About pressure measuring transducers and flow measurement meters.

**Unit III**
the importance of open & closed loop control systems in designing various process control systems and also about the concept of servomechanism.

**Unit IV**
About various data transmission and telemetry systems.

**Paper IV (Embedded systems and Its applications)**

In this paper Students are going to study,

**Unit I**
Various types of architectures, CISC and RISC processors, architecture of 8051 microcontroller and its importance in embedded system design.

**Unit II**
Concept of timers & counters in 8051, the importance of interrupts and also serial communication.

**Unit III**
Difference between 8051 and PIC microcontrollers, architecture and pin diagram of different types of PIC controllers.

**Unit IV**
How to interface various ICs to microcontrollers in designing embedded systems and also how to control various motors by the microcontrollers.
Program Outcomes

- MSC Zoology programme in Sarojini Naidu Vanita Maha Vidyalaya enables the students to extend their knowledge in different branches of zoology and as well as life sciences.
- This programme is a multidisciplinary study which completely gives knowledge about the various branches of life sciences like animals, their evolution, animal physiology, their behaviour, habit, habitat, molecular level organisation of the biomolecules and their mechanisms, laboratory techniques, Research knowledge, environmental study, immunology, systems biology, agriculture and fish biology.
- The students can opt their careers options in different fields like public sectors, zoologists, forest department, laboratories, medical coding, medical analysis, scientific writers, lab technicians, teaching sectors, agriculture units, fisheries department, research etc.

Paper outcomes

Semester - 1

1. Structural biology
   - This paper deals with the cells, biomolecules and their functions in detail which enables the students to get more knowledge of the cell
   - Enzymes and their functions, metabolic cycles are dealt in detail which helps to understand clearly each and every function of the enzyme in the body.
   - The events in the cell and the cellular organisation and the functions of the cell are also included along with the theories which enlightens the students about the cell in detail.

   Outcomes:
   
   One can excel in their career in the laboratories with the knowledge from this paper.
   
   This information also helps in the research work also.

2. Environment and Conservation Biology (ECB)
   - The concepts of ecology and ecosystems enables the students to understand different ecological aspects.
   - Students learn about the Biogeographical regions of India, flora and fauna, natural resources and their management.

   Outcomes:
There will be a better scope for the students in future where the environmental conservation is a major aim of the society.

They can also work under NGO's as per their enthusiasm.

3. **Immunology:**
   - The immunological concepts dealt in this paper helps the students to understand the concept immunology in detail along with the cells and their mechanisms for the immunizing the body.
   - Concepts like hypersensitivity, transplantation helps them to understand the immunology better and to the fullest.
   - Tumors, tumor immunology enables them to understand the concept of cancer, the cells responsible, body’s reaction to those cells.

**Outcomes:**
- Students can get opportunities in the immunological labs with the techniques dealt in the paper.
- This information given in the paper immunology helps them to in the research also.
- Knowledge of tumors and the tumor immunology helps them to have a clear knowledge of cancer.

4. **Taxonomy, systematic and Functional Anatomy of Invertebrates (TSFAI)**
   - This paper is based on the study of Invertebrates in detail.
   - Evolution of the multicellular organisms from the unicellular organisms, protozoa to echinodermata all are dealt along with the interesting characteristics fractures of each and every phylum.
   - Minor phyla and the other small phyla and parasites are also included.

**Outcomes:**
- This paper gives the clear knowledge of the microscopic, unicellular, multicellular organisms and the animals without a vertebral column.
- This knowledge helps them to plan their career in the researches based on the microorganisms and lower level organisms and also helps them to work as a parasitologists.

**Semester – 2**

5. **Tools, Techniques and Biostatistics (TTB)**
   - Knowledge about the tools, their maintenance and application enables the students to understand the mechanism, working and application of the tools of the laboratories.
   - Separation techniques and diagnostic techniques gives the knowledge about the different techniques applied for the separation of different cellular components and diagnosis of them.
• Biostatistics helps them to understand the sampling techniques, measurements, theories of probabilities etc.

Outcomes:

With this knowledge the students can explore their career in different scientific laboratories as lab technicians, analysts etc.

The bio-statistical information plays a key role in the research works, students can plan their career as biostatistic analyst.

6. Animal physiology

• Different metabolic aspects like digestion, respiration, circulation, osmoregulation, thermoregulation, etc are dealt in this paper which enables the students to understand the physiological concepts in detail
• Neurophysiology, receptors and muscle physiology helps the students to understand the physiological events and step by step process for each function in the body.
• Endocrinology gives a clear information about the glands and the hormones.

Outcomes:

The physiological study of the animals enables them to pursue their career in the research.

They can also excel in the laboratories also.

7. Molecular genetics and Developmental biology (MGDB)

• The concept of genetics and the theories explaining the genetic are included in this paper which helps the students to understand the genetic in detail.
• Molecular genetics like hybridization, cloning enables the students to understand the applied molecular biology.
• Step by step developmental aspects, events and the changes from event to event gives a clear knowledge of the development of an organism along with the study of the organ formation and the organ development.

Outcomes:

Students can explore their career in the branches of genetics like laboratories, gene engineering and the applied molecular biology.

They can also plan their career as a developmental advisors in the gynecology departments.

8. Evolution and functional anatomy of vertebrates (EFAV)

• The evolution of the vertebrates from the invertebrates is included in this unit through which the students can understand the evolutionary link of each and every phylum.
• The functional anatomy of vertebrates from fishes to mammals draws a comparison between all three different phylum which enhances the comparative knowledge among the phyla.
• Connecting links between every phylum helps to understand the differences and similarities among the phyla.

Outcomes:
This paper enables the students to carry out research among the phyla and also the extinct organisms also like archaeologists.

There will be a high demand for the zoologists in the future.

Semester – 3
9. Systems biology
• The actual concept of the systems biology is explained in this unit which completely enhances the view of each and every scientific aspect.
• Mammalian biological clocks, the biochemical networks and the connectivity of all the aspects taking place in the body in a whole can be understood in this unit.
• The applications of the systems biology in the day to day living helps students to plan their career accordingly.

Outcomes:
Systems biology is the new trend where the whole system is considered instead of a single organ or an issue.

This knowledge enables the students for the holistic approach which will be the future of the medical sciences and life sciences.

10. Research methodology
• This paper purely deals about the steps of the research and the research proceedings which help the students the concept of research in detail.
• The applications of the statistical methods helps the students to know how to apply the statistical in the research.
• The final report of the research, rules and regulations helps the students to know the laws and the necessities for a research publication.

Outcomes
This paper purely helps the students to plan their career in the research.

Students who are interested in research and who want to opt the research as their career thus paper helps them to explore the nooks and corners of the research from basic to detailed knowledge.

11. Comparative Animal Physiology – 1
• This paper enables the students to gain the knowledge of different physiological events like digestion, nutrition, respiration, osmoregulation, excretion and thermo regulation in a comparative of all the living organisms starting from microorganisms to higher vertebrates.

• Deranged metabolism and disorders clearly states the disorders due to metabolic errors through which students can understand the metabolic disorders

**Outcomes:**

Students can plan their career as zoologists

They can also work under the animal laboratories as they will be having the knowledge of each and every physiological event in a comparative way.

12. **Sericulture**

• This paper is purely based on the silk worm rearing and culturing through which students can understand the techniques of silk worm rearing.

• This paper gives information about the mulberry cultivation, diseases of mulberry and maintenance through which students can understand the process and maintenance of monoculture.

• The biology of the silk worm, diseases and their maintenance is included along with the industrial production of the silk fiber which enlightens the students about the maintenance and marketing of the silk.

**Outcomes:**

Students can plan their career in organising a moriculture unit or mulberry cultivation.

This paper also helps them to set up their own sericulture unit as an occupation and also the feeling or dying industry.

They are eligible to work in Central Silk Board (CSB).

**Semester – 4**

13. **Animal biotechnology**

• This paper deals with the application of the biotechnological techniques for the improvement of animals which helps the students to understand the concept animal biotechnology.

• Various culture and cloning techniques enhances the students about the process and the requirements of particular experiments.

• Production of different animals with desired qualities and their applications helps students to understand the importance of the cloning and culturing techniques.

**Outcomes:**

Students can work under the biotechnological laboratories
This knowledge also helps the students to proceed for the research.

14. Fish Biology
- This paper deals with the evolutionary aspects and ancestors of the fishes which are the first vertebrates and completely aquatic animals which helps the students the evolution of Invertebrates to vertebrates.
- The connecting links between each and every class of the fishes enables the students to understand the evolutionary progress between the ancestral and present day fishes.
- The morphology, mechanism and the embryogeny of the fishes is clearly explained in this unit which helps the students to understand in detail about the physiological as well as morphological aspects of fishes.

Outcomes:
Students can plan their career in the fisheries.
The knowledge about the fishes help them to carry out research.

15. Comparative Animal Physiology – 2
- The response of animals to the environment and the effects of response in a comparative way is explained in this paper which helps the students to understand the reaction of each and every organism and it’s response in different conditions.
- Circulation and the body fluids, control of reproduction and adaptations are included where students can understand the different circulatory mechanisms and different body fluids of animals in a comparative way along with the control and factors for the control of reproduction.

Outcomes:
Students can plan their career as a zoologists as they clearly know each and mechanism in the animals in a clear and comparative way.
The information in this paper also helps them to carry out research.

16. Project work
- This project work which is included as a paper helps the students to experience the process of research and inculcated the interest of the students to the researches.
- Students who want to plan their career as a researchers this project work paper helps them to practically understand the research methodology.
- This project work helps students to explore different scientific fields under the life sciences for their project presentation.
- The students will get a exposure and they will get a chance to interact and work with the laboratories, hospitals, research scholars etc which helps them to plan their career.
SEM – I    Physics Paper – I    Mechanics

Course Objectives and out comes:

1. Relative motion, inertial and non-inertial frames of references.
2. Study of interaction of force between solids in mechanical systems.
3. Center of mass and inertial tensor of mechanical systems.

SEM – II    Physics Paper – II    Waves and Oscillations

Course Objectives and out comes

1. Distinguish between oscillators and normal models in a coupled oscillator system.
2. Application of Fourier transforms to a range of physical situations.
3. Description of longitudinal wave in solids.

SEM – III    Physics Paper – III    Heat and Thermodynamics

Course Objectives and out comes

1. The main goal of this course is to acquire fundamental knowledge of classical and quantum statistical mechanics; construct a bridge between macroscopic thermodynamics and microscopic statistical mechanics by using mathematical methods and fundamental physics for individual particles.
2. Learn to analyze energy transfer and transformation in systems using fundamental concepts of properties of materials, work, heat, internal energy, entropy, equilibrium and relations derived from the first and second laws of thermodynamics.
3. Learn applications of Thermodynamic concepts.
4. Explain the second law of thermodynamic in terms of reversible and irreversible processes involving thermal energy reservoirs, heat engines, refrigerators.
5. Ability to understand the basic concepts of thermodynamic such as temperature, pressure, system, properties, process, state, cycles and equilibrium.
6. Use the first law of thermodynamics to calculate the work, power output/input, heat transfer, or heat transfer rates for thermodynamic processes or cycles containing solids, liquids, vapors, and/or ideal gases.

7. They are able to understand how to produce low temperature using different expansions.

8. Apply statistical mechanics to solve for real systems (a system for many particles).

9. Students can understand properties and laws of thermal radiations and how the energy distribution in thermal spectrum.

**SEM – IV  Physics Paper – IV  Optics**

Course Objectives and outcomes

1. Basic nature of light, and how the light interacts with matter.

2. Become familiar with optics laboratory experiments and procedures.

3. The students should demonstrate fundamental knowledge and insight into physical optics and geometrical optics in order for student to be able to understand and solve problems related to the eye and optical instruments/lenses, their function and correction.

4. Students are expected to understand ray-based optical system analysis and design, and operation of simple optical instruments.

5. Knowledge and understanding should be demonstrated in the areas of: (1) refraction at single spherical or plane surfaces, (2) thin lenses, (3) thick lenses, (4) aberrations.

6. Understand that light is an electromagnetic wave and understand properties of light caused by the wave nature such as polarization, interference and diffraction.

7. To learn the basic elements of optical fiber transmission link, fiber modes configurations.

**SEM – V  Physics Paper – V  Electricity and Magnetism**

Course Objectives and outcomes

1. Developing systematic reasoning.

2. Use of coulombs law, application of Gauss law.

3. Relation between electric field and potential.
4. Use of Lorentz force law, Amperes law, Faradays law for magnetic forces.
5. Analyze Maxwell’s Equations in different forms and apply them to solve problems on electromagnetic fields.


Course Objectives and out comes

1. Elastic properties of solids and lattice vibrations.
2. Properties of metals on the basis of the free and nearly-free electron gas models.
5. Optical properties of solids and relation to their electronic properties.

SEM – VI       Physics Paper – VII       Modern Physics

Objective: To familiarize the students with quantum mechanics & its application to various problems. To deal with wave mechanics like Schrodinger equation & its solution. It enlightens the students on the basics of nuclear physics.

Out comes:

1. Demonstrated ability to solve relativistic mass, energy and momentum problems.
2. Demonstrated ability to apply wave – particle duality and uncertainty principle, quantum mechanical Eigen value equation etc. to solve physics problems.
3. Understand and explain the differences between classical and quantum mechanics.
4. Understand the fundamental principles of nano technology and their application in various fields of science and technology.

SEM - VI       Physics Paper – VIII A      Basic Electronics

Course Objectives and out comes

1. To apply concepts of electric network topology, nodes, branches, loops to solve circuit problems.
2. To understand open circuit, short circuit, transmission, hybrid parameters and inter relationship between them.
3. To understand the basic concepts and basic laws of dc and ac electrical network and solve them using mesh and nodal analysis techniques.

4. By studying network theorems students will learn the method to reduce complex network to simple networks.

5. Students will learn different number systems and their inter conversions, understand Boolean algebra, construction of logic gates and verification of truth tables for various gates and De Morgan’s theorems.
DEPARTMENT OF PHYSICS AND ELECTRONICS

B.Sc Electronics

Course Outcomes

SEM I: Circuit analysis

On completion of the course, students are able to:

1. Understand electronic systems with a continuously variable signal
2. Understand proportional relationship between a signal and a voltage or current that represents the signal.
3. To learn function of basic component’s use in linear circuits.
4. Understand component symbol, working principle, classification and specification.
5. To learn different theorems for simplification of basic linear electronics circuits.
6. To Learn to operate and know working principles of CRO

SEM II: Electronic Devises

On completion of the course, students are able to:

1. Understand Basic Circuits using Active Devices
2. Learn function of basic circuit components used in linear circuits.
3. Understand basic construction, equivalent circuits and characteristics of basic electronics devices.
4. Students understand basic linear electronics circuits and their working principle,

SEM III: Analog Circuits:

On completion of the course, students are able to:

1. To understand Basic Analog Circuits and their applications using Active Devices
2. To learn basic function of single stage amplifier, multistage amplifier and feedback Amplifier and their working principle.
3. To understand basic construction of feedback circuits and their application in Oscillators
4. Understand basic amplifier and oscillator circuits and their application in analog circuits.

**SEM IV: Linear Integrated Circuits and Basics of Communication**

On completion of the course, students are able to:

1. To understand Basic differential amplifier and their applications in linear Integrated circuits
2. To learn basic function of operational amplifier, Ideal and practical characteristics and their mathematical application.
3. To understand basic construction of active filters, comparators and their application in electronics.
4. Students understand different types of multivibrator and wave form generator using IC 555.

**SEM V: Digital Electronics**

**Paper V**

On completion of the course, students are able to:

1. Understand basic digital electronic systems
2. To learn function of basic digital circuits and use of transistors to create logic gates in order to perform Boolean logic.
3. To learn different theorems for simplification of basic Digital electronics circuits.
4. Student understand symbols, Truth tables, Boolean equations, & working principle.
5. Understand combinational and logical digital circuits and their differences.
6. Students will be introduced to Flip-flop, shifts register, counters and Semiconductor memory for data Processing circuits.

**Paper VI: 8085 Micro Processor and Applications**

On completion of the course, students are able to:

1. To understand the basic architecture of 8- bit microprocessors.
2. Able to write programs on 8085 microprocessor based systems.
3. Identify the addressing modes of an instruction.
4. Develop programming skills in assembly language
5. Applications of 8085 microcontroller

**SEM VI**

**Paper VII: Digital Communication**

On completion of the course, students are able to:

1. Apply basic science and mathematics to analyze complex engineering problems.
2. Gather requirement specifications, design and test electronic systems.
3. Analyze and design noise-free analog and digital communication systems.
4. Evaluate strengths and weaknesses of evolving state of art communication systems.
5. Select partitioning technologies for implementation of wired and wireless communication system.
6. Learn the different methods of error detection and correction in transmission and reception.

**Paper VIII: 8051 Microcontroller and Applications**

On completion of the course, students are able to:

1. To understand the basic architecture of 8-bit microcontrollers
2. Able to write programs on 8051 microcontroller based systems.
3. Identify the addressing modes of an instruction.
4. Develop programming skills in assembly language
5. Applications of 8051 microcontroller
PROGRAMME SPECIFIC OUTCOME

UNIT- I : Brief History of Invertebrates (co-I):

Students will appreciate the importance, value and diversity of the invertebrates. Understands the diversity, evolution and relationships between major groups of invertebrates.

UNIT- II : Cnidarians and Helminthes (co-II):

Important phyla comprising most of the freshwater ecosystem. Coral reef forms world’s most productive ecosystem. Help with nutrient recycling, assist in carbon and nitrogen fixing, source of nitrogen and nutrients for marine food chains. Able to study the host parasite interaction, help to study diseases caused by the helminthes.

UNIT- III : Annelida and Arthropoda (co-III):

Annelids showing division of body and play a key role in evolution. Important decomposers and useful in medicinal field. Arthropoda includes more species and more individuals than all other groups of animals species. Used in experimental to reveal valuable basic biological information. Help to grow food crops through pollination, create and maintain soil quality.

UNIT- IV : Mollusca, Echinodermata and Hemichordata (co-IV):

The objectives of this study were to analyze the distribution pattern of molluscs in freshwater systems. A total of 45% freshwater habitats were sampled for living mollusks. Echinodermata play numerous ecological roles. Sand dollars and sea cucumbers burrow into sand providing more oxygen at greater depths of the sea floor. Also used as food, medicine and source of lime for farmers.

- To understand the taxonomical position of different invertebrate phyla.
- Students should know the important functions which is carried out by invertebrates like decomposing, nutrient recycling, gaseous fixation etc.
- Used as a model in research and the students also.
UNIT-I : Ecology-I (co-I):

Study help to explore about different type of ecosystem and they function and also interaction between environment and organism. Students get to know about the different nutrient cycles which is the basic source of energy. Get the knowledge about the animal behavior in response to that ecosystem and how they survive in that particular environment.

UNIT-II : Ecology-II (co-II):

Study reveals the problems faced by the animals with population explosion and insufficient resources available for them in the ecosystem. It help in wild life conservation and protecting endangered species. Help in understanding the movement of materials and energy through living communities. Study the abundance and distribution of organism and biodiversity in the context of the environment.

UNIT-III : Zoogeography-III (co-III):

It is the study of some paradoxical to begin an account of animal distribution by a reference to cave animals which have by far the most isolated and circumscribed habitat of all the ecological communities. Nevertheless a comparision of the cave habitat with those of the open lands seems to me to have some bearing on the problems of animals distribution.

UNIT-IV : Animal Behavior-IV : (co-IV):

Students will be able to exhibit critical and integrative thinking skill.
Invertebrates fishes are used as a basis to show that their communities have only a weak relationship to the structure of phytocenoses, unlike plants vertebrates actively choose preferable biotopes and do not evolve upon transition between the stages of succession. The role of vertebrates in the functioning of ecosystems is determined to matter and energy turnover and effect on the structure of ecosystems of different ranks.

UNIT-II : Amphibia & Reptilla-II: (co-II) :

Students will be able to appreciate about how life have evolved. From water to land, their populations and their habitats are of profound importance to advancement of basic scientific knowledge that is vital to the well being of human societies.

UNIT- III : Aves & Mammals –III : (co-III) :

Ornithology help to develop several key concepts in evolution, behavior and ecology. Adaptations by birds help to know about the evolution and physiology of birds, as they are the only phyla which is showing aerial mode of life. Taxonomy help in finding the evolutionary significance. Many species are extincting, so it help for conservation of species. Play a key role in biodiversity an evbolution.

UNIT-IV : Developmental Biology & Embryology –IV : (co-IV) :

Embryology and developmental biology focuses on the growth and development of plants and animals at the genetic, cellular and molecular levels. Developmental biology studies the various actions involved in the developmental biology studies the various actions involved in the development of living organisms. Embroyology is a section of developmental biology that focuses on the development from one undifferentiated cell to a complete organism. This unit helps in understanding the developmental process from the embryological level.

- Students should be able to described unique characters of Fishes, Amphibian, Reptiles, Aves & Mammals.
- Students should be able to recognize life functions of these classes.
- To understand the ecological role of different classes in vertebrates.
- To understand the diversity of vertebrates.
UNIT- I : Cell Biology - I : (co-I) :

Cell teaches us about the biological processes that keeps us healthy. It also uncovers new ways to treat diseases. Cellular research as lead cancer treatments, antibiotics, medicine the lowers cholesterol and improved methods for delivering drugs. Example, understanding how stem cells and certain other cells regenerate could offer insight on how to repair damaged or lost tissue.

UNIT-II : Molecular Biology – II : (co-II) :

Students can learn the molecular basic of biological activity between biomolecules in the various system of a cell including the interactions between DNA,RNA, Proteins and their biosynthesis.

UNIT-III : Genetics- III : (co-III) :

It is the study of gene, the basic heredity material of living organism. Students get to know about the how and why physical characters are passed on from one generation to another. Help to study the pattern in genetic information. Comprehensive and detailed understanding of the chemical basic of heredity.

UNIT –IV : Evolution –IV : (co-IV) :

It is the study to described origin of species on earth. To describe evolutionary history of man. Be familiar with events that lend up to fertilization. Students get to know about the first four stages of cell division in different groups and cellular mechanisms for gastrulation.
UNIT- I & II : (CO – I & II ) :

The scope of study is of inter disciplinary nature involving Microbiology, Ecology, Environment, Biology of Earthworms, Biotechnology and Civil Engineering Etc.

The study of this vericulture is to initiate with a preliminary literature survey on generation of wastes technologies for the treatment and with special reference to vericulture biotechnology.
Sericulture being low capital intensive, suits landless formers and low skilled artirans. For primary survey four sericulture rich villages in maida district has been choren, where 60 silk artiran households were selected in random sampling for enquiring about their livelihood and income generation. The paper tests the statistical significance all income generating factors of the sericulture industry including land productivity with advent of technology and developments that come with it there has been a wide variety of job oppurtunities in both public and private enterprises.
UNIT- I : Physiology - I : (CO – I ) :

The study of physiology is in a sense the study of life. From the study students are enlightened about how digestion, respiration, circulation and excretion work as physiological processes.

UNIT - II : Physiology (co –II) :

From this unit the students learns about how muscle and nervous systems function and also the importance of endocrine glands and their secretions.

UNIT-III : Physiology and Biochemistry (co – III ) :

Biomolecules and metabolism study of all sorts of processes that occur with in a biological cell and also interactions between different cells. Studies include biomolecules structure biochemicals mechanisms i.e., metabolic pathways, their control, phsssssyiological importance and clinical relevant.
UNIT- I : Basics of Entomology (CO – I) :

The class insect is generally considered to have evolved from a myriapod or protomyriapod of some sort during the Devonian period. Based on differences in mandibles and mandibular movement, Manton (1964) concluded that insects are not direct descendants of myriapods and that these groups are best looked upon as sharing a common ancestor.

UNIT –II : Insect Vectors and Pests (co –II) :

Insects have more ancient lineage; trilobites and crustaceans being abundant in the oceans as long as 500 million years ago. Trilobites are extinct but crustaceans are still very much in the ocean and freshwater bodies. The earlier occupancy of the water bodies by great numbers of crustaceans may explain, why insects have not occupied the oceans to any appreciable extent.

UNIT –III :Beneficial Insects and Harmful Insects (co – III) :

Entomology (from Greek entomon=insect and logos =discourse) is a branch of zoology which deals with insects. In this branch we study the origin and evolution of insects and their diversity and classification, body organization and functions, development, interactions with surroundings in which they live, past history and their economic importance.
UNIT-I: Vector Biology of Public Health Important (CO – I)

It deals with the life cycles of different vectors and disturbance causes to human or other animals. It gives knowledge to the students about the parasitic diseases which are affecting the human body like Malaria, Dengue etc. and how to prevent those diseases. Students get to know about what is actually causing diseases and what is transmitting it i.e., vectors like mosquitoes, files, mites.

UNIT-II Basic Sanitation and Public Health (co-III):

Students get to know about the basic management of resources and how to manage water waste, human excreta and recycling methods which should be adapted to overcome the problems which is causing disturbance to human life. Students get to know about the diseases which are easily transmitted in communities that have low level of sanitation for any social and economic development, adequate sanitation in conjunction with good hygiene and safe water are essential to good health.
UNIT- I : Basics of Entomology (CO – I) :

Students learn about the basic concepts of Immunology. They get familiar with the cells that get involve in the immune system they gain information about primary and secondary organs of immune system. Students acquire knowledge on the types of immunity they get to know about how the antigen and antibody reacts and also the reactions that triggered the immune response. They get to know how the B-Cells and T-Cells gets activated and how the specific antibodies are produced for a particular antigen. They also learn about hybridoma technology.

UNIT-II Working of an Immune System; Immune Systems; Immune System in Health and Diseases (co-II) :

Students will be enlightened on the study of immune systems, malfunctions of the immune system in immunological disorders.

UNIT-III Animal Biotechnology and Genetically Modified Organisms (co-III) :

Study helps the student to understand molecular biology techniques used to genetically engineer animals in order to improve their suitability by the application of scientific and engineering principles to the processing by biological agents.
UNIT- I : Aquatic Biomes (CO – I) :

Aquatic science is the multi-disciplinary study of aquatic ecosystems, both surface water ground water. The students are enlightened on the study of physical, geological, chemical and biological processes influencing fresh and salt water systems. Human influences on our lakes, streams, rivers, ponds, oceans, pollution, and erosion, over fishing and the alteration of natural areas around and within bodies of water all have serious consequences for the environment and often for human health.

UNIT – II : Fresh Water Biology and Marine Biology (co –II) :

Students will understand both branches of aquatic biology are important, combining our need for unpolluted fresh water and natural resources with our desire to leave plants and animals. The habitat they need to survive.

UNIT – III : Management of Aquatic Resources (co –III) :

The course aims to provide an advanced and multidisciplinary insight into ecology with a special emphasis the use of resources and management and conservation.