



**VIT**<sup>®</sup>

**Vellore Institute of Technology**  
(Deemed to be University under section 3 of UGC Act, 1956)

# Admission to Integrated M.Sc. Programmes 2022-23

## Programme Details

*A place to learn; a chance to grow*



SI. NO.	About the Programme	PAGE NO
1	Integrated M.Sc. Biotechnology	2
2	Integrated M.Sc. Food Science and Technology (5 Year)	4
3	Integrated M.Sc. Computational Statistics and Data Analytics	8
4	Integrated M.Sc. Physics (5 Year) with exit option B.Sc. Physics (3 Year) or B.Sc. Physics (Hon) (4 Year)	10
5	Integrated M.Sc. Chemistry (5 Year) with exit option B.Sc. Chemistry (3 Year) or B.Sc. Chemistry (Hon) (4 Year)	12
6	Integrated M.Sc. Mathematics (5 Year) with exit option B.Sc. Mathematics (3 Year) or B.Sc. Mathematics (Hon) (4 Year)	15
7	Dual Degree M.Sc. Data Science (5 Year) with Exit Option B.Sc. Data Science (3 Year)	17

### 3. About the programme

#### **Integrated M.Sc. Biotechnology (5 Year)**

The Integrated M.Sc. Biotechnology (5 Year) programme is a 5 year integrated course offered in VIT Vellore, TN & VIT Bhopal campuses .

#### **Programme Educational Objectives:**

- ◆ Excel in professional career and/or higher education by acquiring a solid foundation in science, mathematics, and advanced communication engineering and technologies
- ◆ Develop and apply engineering solutions for solving contemporary, social and human issues with realistic constraints suitable for the present need through the use of modern tools.
- ◆ Exhibit professional and ethical standards, effective communication skills, teamwork spirit, multi-disciplinary and trans disciplinary approach for successful careers and to be able to compete globally, function as leaders, as entrepreneurs, and manage information efficiently and to engage in lifelong learning

#### **Programme Outcome:**

- ◆ A clear understanding of the subject related concepts and of contemporary issues
- ◆ Problem solving ability- solving social issues and engineering problems
- ◆ A clear understanding of professional and ethical responsibility
- ◆ Interest in lifelong learning
- ◆ Adaptive thinking and adaptability
  
- ◆ Cross cultural competency exhibited by working in teams
- ◆ An ability to design and conduct experiments, as well as to analyze and interpret data
- ◆ A good working knowledge of communicating in English
- ◆ An ability to use techniques, skills and modern engineering tools necessary for engineering practice
- ◆ A good cognitive load management [discriminate and filter the available data] skills

**Programme Specific Outcome:**

- ◆ Gain and apply knowledge to plan, analyze and find innovative solutions in the field of biological sciences
- ◆ Explore problems and provide valid solutions through the industry-academia interactions.
- ◆ Acquire interdisciplinary knowledge in the areas of biological, chemical, environmental and technical sciences for the benefit of society.

**Scope of Employment:**

- ◆ Graduates will have a broad scope in the field of biotechnology.
- ◆ The opportunities are enormous in India and abroad.
- ◆ The field of biotechnology is expected to grow exponentially in the coming years offering opportunities in the field of research, engineering, industry, consultancy, and entrepreneurship.

**Programme Core Courses:**

Molecular biology / Bioprocess Technology / Immuno-technology / Enzyme Technology / Analytical Instrumentation / Pharmaceutical Biotechnology / Genetic Engineering / Animal Biotechnology / Plant Biotechnology.

**Elective Courses:**

Biomedical Engineering / Tissue Engineering / Management Bioethics.

## **Integrated M.Sc., Food Science and Technology (5 Year)**

### **About the Programme:**

To develop innovative, creative and vibrant professionals and researchers by imparting contemporary knowledge and technical skills to cater to the dynamic needs of food sciences industry. The programme also focuses in fostering the spirit of innovation and creativity in the young minds in solving the real time problems arising in the society and industry. The programme instils confidence, ethics, values and employability skills to mold an ethically conscious individuals who focus on sustainable growth of the economy by providing hygienic food products for the well-being of the society.

### **Programme Educational Objectives:**

Graduates will be practitioners and leaders in their chosen field

Graduates will function in their profession with social awareness and responsibility

Graduates will interact with their peers in other disciplines in their work place and society and contribute to the economic growth of the country

Graduates will be successful in pursuing higher studies in their chosen field

Graduates will pursue career paths in teaching or research

### **Programme Outcome:**

Having a clear understanding of subject-related concepts and contemporary issues

Having an ability to design and conduct experiments, as well as analyse and interpret data.

Having an ability to use techniques, skills and modern tools required for scientific career.

Having problem-solving ability for social issues.

Having adaptive thinking and adaptability.

Having a clear understanding of professional and ethical responsibility.

Having cross-cultural competency exhibited by working in teams.

Having a good working knowledge of communicating in English.

Having good cognitive load management skills.

Having interest in lifelong learning.

- Food Chemistry
- Food Microbiology
- Food Chemistry and Food Microbiology Lab
- Physiology and Nutrition
- Food Additives
- Food Quality and Analysis
- Food Preservation Technology
- Food Analysis and Preservation
- Food Engineering
- Food Packaging
- Food Engineering and Packaging Lab
- Milk and Milk Products Technology
- Nutraceuticals and Functional Foods
- Food Toxicology and Safety
- Food Toxicology and Safety Lab
- Animal Products Technology
- Animal and Milk Products Lab
- Food Laws and Regulations
- Food Equipment Design and Automation
- Baking and Confectionary Technology
- Baking and Confectionary Lab
- Food Process Technology
- Production Technology of Spices and Plantation Crops
- Grain Science and Technology

Grain, Spices and Plantation Products Lab

**Discipline Elective Courses:**

- Food Adulteration
- Food Fermentation and Synbiotic Food Technology
- Food Nanotechnology

**Programme Specific Outcome:**

On completion of Integrated M.Sc., (Food Science and Technology) programme, graduates will be able to

Formulate innovative solutions utilising critical research skills to address the real-time scenarios combining the appropriate science and technology and discover new techniques and tools for improvisation/modernization in food processing, food preservation and production.

Assess the quality of the food and ensure maintenance of ethical standards in food production for fostering a healthy generation.

Apply the knowledge, problem-solving, and research skills in multifaceted careers at health care, food industry, agricultural produce, and government roles

**Scope of Employment:**

As per IBEF, the Indian food industry is expanding at a CAGR of 11% and the food processing sector accounts for 32% of the total food industry. India's food sector attracted US\$ 4.18 billion in foreign direct investments between April 2014 and March 2020. India's food processing sector is one of the largest in the world and its output is expected to reach US\$ 535 billion by 2025-26. This sector is expected to generate 9 million jobs by 2024 providing wide opportunities to the graduates and post graduates in Food Science Technology.

The course provides insight for the students to excel in varied disciplines like dairy, fruit and vegetable, bakery, meat, poultry, quality, production, food testing, fermentation, brewery, sensory analyst and many others. They can venture into wide spread avenues as Food technologist, Nutrition therapist, Food analyst, new product and process developers, Food safety officer (FSSAI), Food inspector, Agricultural research scientist (ICAR), scientist in Food corporation of India and Food laboratories.

The graduates and the post graduates can contribute to the economic development through innovative start-ups and sustainable projects to support the farmers of the country and the industry growth

**Discipline Core Courses:**

- Principles of Food Science
- Food Forensics
- Food Rheology
- Technology of Fats and Oils
- Fruit and Vegetable Processing Technology
- Crop Production Concepts and Practices
- Nutrition and Dietetics
- Industrial Enzymology
- Beverage Processing Technology

Technical Answers to Real Problems

**Skill Enhancement Elective Courses:**

Value Added Food Products

Mushroom Farming

Beekeeping and Honey Processing

Biofortification of Foods

Computer Programming: Java

**Open Elective Courses:**

Principles of Management

Marketing Management

Human Resource Management

Total Quality Management

Supply Chain Management

Consumer Behavior

International Business

Design Thinking for Innovation

Entrepreneurship

Fundamentals of Finance and Accounting



## Integrated M.Sc. Computational Statistics and Data Analytics (5 Year)

### Programme Educational Objectives:

- To train the next generation of statisticians with a focus on the field of data analytics.
- The students will learn the principles and methods of statistical analysis and put them into practice using a range of real-world data sets.
- To provide a unique and coherent blend of modern statistical methods together with the associated computational skills.
- To use computational tools on problems of applied nature.
- To offers training in modern statistical methodology, computational statistics and data analysis from a wide variety of fields, including financial and health sectors.
- To learn advanced level of statistical knowledge and data analytical skills.

### Scope of Employment:

- Data Analyst
- Business Analyst
- Data Visualisation Engineer
- Data Science Consultant
- Data Analyst roles in all sectors

### Course Content:

Fundamentals of Mathematics/ Linear Algebra and Applications / Real Analysis and Applications / Discrete Mathematics / Computational Thinking / Problem Solving with Object Oriented Programming / Basic English / Communicative English / Foreign Language / Environmental Studies / Ethics and Values / Lean Start-up Management / Introduction to Soft Skills / Introduction to Personal Skills / Fundamentals of Aptitude / Introduction to Business Communication / Reasoning Skill Enhancement / Soft Skill / SET Conference / Research Methodology / Comprehensive Examination / Master's Thesis.

**Programme Core:**

Fundamentals of Statistics / Probability and Random Variables / Basic Statistical Methods / Distribution Theory / Sampling Techniques / Theory of Estimation / Testing of Hypothesis / Regression Analysis and Predictive Models / Design and Analysis of Experiments / Operation Research / Statistical Quality Control / Time Series analysis and Forecasting / Multivariate Data Analysis / Stochastic Processes and Applications / Reliability Theory and Survival Analysis / Statistical Methods for Data Mining / Econometric Analysis.

**University Elective:**

**Algorithms:** Design and Implementation / Big Data Analytics / Database Systems: Design and Implementation / Machine Learning.

**Programme Elective:**

Python Programming for Data Science / Programming for Data Science using R / Programming for Data Science using SPSS / Programming for Data Science using SAS / Programming for Data Science using MATLAB / Programming for Data Science using MINITAB / Queuing Theory and Network Analysis / Non-Parametric statistics / Bio-statistics / Advanced Operation Research / Actuarial Statistics / Bayesian Inference / Total Quality Management and Six sigma / Statistics for Management sciences / Statistics for Financial Modelling / Inventory Models / Statistical Methods for Bio-informatics / Demography and Official Statistics / Statistical Process Control / Statistical Consulting / Statistics for Biological and Earth Sciences / Statistics for Social and Behavioural Sciences / Statistics for Research, industry and Community Development / Statistics for Forensic Sciences.

## **Integrated M.Sc. Physics (5 Year)**

**with exit option B.Sc. Physics (3 Year) or B.Sc. Physics (Hon) (4 Year)**

### Programme Educational Objectives

- Excel in professional career and/or higher education by acquiring a solid foundation in science, mathematics, and advanced communication engineering and technologies
- Develop and apply engineering solutions for solving contemporary, social and human issues with realistic constraints suitable for the present need through the use of modern tools.
- Exhibit professional and ethical standards, effective communication skills, teamwork spirit, multi-disciplinary and transdisciplinary approach for successful careers and to be able to compete globally, function as leaders, as entrepreneurs, and manage information efficiently and to engage in life-long learning

### Programme Outcomes

- Having a clear understanding of the subject related concepts and of contemporary issues
- Having an ability to be socially intelligent with good SIQ (Social Intelligence Quotient) and EQ (Emotional Quotient)
- Having Sense-Making Skills of creating unique insights in what is being seen or observed (Higher level thinking skills which cannot be codified)
- Having design thinking capability
- Having computational thinking (Ability to translate vast data in to abstract concepts and to understand database reasoning)
- Having Virtual Collaborating ability
- Having problem solving ability- solving social issues and engineering problems
- Having a clear understanding of professional and ethical responsibility
- Having interest in lifelong learning
- Having adaptive thinking and adaptability
- Having adaptive thinking and adaptability
- Having cross cultural competency exhibited by working in teams
- Having an ability to design and conduct experiments, as well as to analyze and interpret data
- Having an ability to use the social media effectively for productive use

- Having a good working knowledge of communicating in English
- Having an ability to use techniques, skills and modern engineering tools necessary for engineering practice
- Having critical thinking and innovative skills
- Having a good cognitive load management [discriminate and filter the available data] skills
- Having a good digital footprint

### Scope of Employment

- Students after successful completion of BSc, BSc. Honours and Integrated MSc will have the opportunity for Campus Placement.
- A few companies are visiting campus exclusively for Science students.
- Students will have a few elective courses to improve the employability.
- The courses are designed so as to have foundation in Physics to clear National Level Eligibility Test and preparing suitable for Higher Education.

### Programme Core Courses

Physics of Waves , Mechanics-I, Heat & Thermodynamics, Properties of Matter, Electricity & Magnetism, Mechanics-II, Mathematical Physics-1, Optics, Modern Physics, General Physics Lab-I, Electronics Lab, Spectroscopy, Introduction to Solid State Physics, Mathematical Physics-II, Digital Electronics, General Physics Lab-II, Digital Electronics Lab, Computer Programming, General Physics Lab-III, General Physics Lab-IV, General Physics Lab-V, Computational Physics Lab.

### Programme elective courses

Microprocessor, Nuclear and Particle Physics, Microcontroller, Programming Languages (Java), Data structure and Algorithm (Basic), Data structure and Algorithm (Advanced), Classical Mechanics - I, Quantum Mechanics - I, Statistical Physics, Classical Mechanics - II, Quantum Mechanics - II, Condensed Matter Physics, Electromagnetic Theory, Nanomaterials and its applications, Photonics, Laser Physics, Non Linear Dynamics, Characterization of Materials.

## **Integrated M.Sc. Chemistry (5 Year)**

**with exit option B.Sc.Chemistry(3 Year) or B.Sc. Chemistry (Hon) (4 Year)**

### Programme Educational Objectives

- Graduates will be practitioners and leaders in their chosen field.
- Graduates will function in their profession with social awareness and responsibility.
- Graduates will interact with their peers in other disciplines in their work place and society and contribute to the economic growth of the country.
- Graduates will be successful in pursuing higher studies in their chosen field.
- Graduates will pursue career paths in teaching or research.

### Programme Outcomes

- Having a clear understanding of the subject related concepts and of contemporary issues.
- Having an ability to be socially intelligent with good SIQ (Social Intelligence Quotient) and EQ (Emotional Quotient).
- Having Sense-Making Skills of creating unique insights in what is being seen or observed (Higher level thinking skills which cannot be codified).
- Having design thinking capability.
- Having computational thinking (Ability to translate vast data in to abstract concepts and to understand database reasoning).
- Having Virtual Collaborating ability.
- Having problem solving ability- solving social issues and engineering problems.
- Having a clear understanding of professional and ethical responsibility.
- Having interest in lifelong learning.
- Having adaptive thinking and adaptability.
- Having cross cultural competency exhibited by working in teams.
- Having an ability to design and conduct experiments, as well as to analyze and interpret data.
- Having an ability to use the social media effectively for productive use.
- Having a good working knowledge of communicating in English.
- Having an ability to use techniques, skills and modern engineering tools necessary for engineering practice.

- Having critical thinking and innovative skills.
- Having a good cognitive load management [discriminate and filter the available data] skills.
- Having a good digital footprint

### Scope of Employment

- The curriculum and syllabi of Integrated M Sc Chemistry are formulated to orient the students to breadth and depth of experimental techniques using modern instrumentation with hands-on training.
- To equip our Integrated PG students for '2026 workforce of our nation' through proper training and resource utilization

### Jobs in Private Sector-through placement cell, VIT

- Placement opportunities will be provided through the PAT (placement and training) office, VIT.
- As of now 20-30% of our PG students are hired by the pharmaceutical, analytical and other companies as Junior Executive-R&D, QC- Executive Trainee, Subject expert, Analystst etc.

### The companies visited last year are:

- ◆ Dr. Reddy's laboratory
- ◆ Hindustan Unilever R & D
- ◆ Mitsui Kinzoku Components India Pvt. Ltd
- ◆ Ramky Enviro engineers ltd
- ◆ Six Red Marbles, Chennai
- ◆ Sterile Gene Life Science Pvt Ltd, Puducherry
- ◆ DSK Inno Sciences Pvt. Ltd
- ◆ Madras Pharmaceuticals
- ◆ Arco Lab Private Limited

- After the successful completion of this programme the students will be able to find lots of job opportunities in private sector through offline sessions too.
- The various employment opportunities for Integrated MSc Chemistry programme are Research Scientist, High school teacher, Quality control chemist, Chemist, Quality assurance Quality manager, Laboratory assistant, Operations manager, Quality control inspector, Application Specialist.

### Jobs in Government Sector

- There are a huge scope and employment available to Integrated MSc chemistry graduates as there is a huge scope for research in various government facilities.
- The various government job opportunities are Chemist, Research analyst, Assistant professor, Research engineer, Production supervisor, Senior research associate, Quality control analyst, Research officer etc.

### Programme Core

General Chemistry-I, II, Lab, Inorganic Chemistry-I, II, III, IV, Lab I, II, Organic Chemistry-I, II, III, IV Lab I, II, III, Physical Chemistry-I, II, III, Lab I, II, III, Analytical Chemistry-I, Research Methodology.

### Programme Electives

Introduction to Biochemistry, Computer-II, Bioinformatics, Spectroscopy-I, II, Physical Chemistry-IV, Advanced Organic Chemistry-I, II, Lab I, Advanced Inorganic Chemistry-I, II, Lab I, Advanced Physical Chemistry-I, II, Lab I, Computational Chemistry, Advanced Analytical Chemistry-I, Organic/Medicinal Chemistry Practical, Inorganic/Material Chemistry Practical, Analytical/Physical/VAC1836.

## **Integrated M.Sc. Mathematics (5 Year)**

**with exit option B.Sc. Mathematics (3Year) or B.Sc. Mathematics (Hon) (4 Year)**

### Programme Educational Objectives

- Having a clear understanding of the subject related concepts and of contemporary issues.
- Having an ability to be socially intelligent with good SIQ (Social Intelligence Quotient) and EQ (Emotional Quotient).
- Having Sense-Making Skills of creating unique insights in what is being seen or observed (Higher level thinking skills which cannot be codified)
- Having an ability to design a component or a product applying all the relevant standards and with realistic constraints.
- Having computational thinking (Ability to translate vast data in to abstract concepts and to understand database reasoning).
- Having problem solving ability- solving social issues and engineering problems.
- Having an ability to design and conduct experiments, as well as to analyze and interpret data.
- Having an ability to design and conduct experiments, as well as to analyze and interpret data.

### Programme Outcomes

- Provide knowledge of a wide range of mathematical techniques and application of mathematical methods/tools in other scientific and engineering domains.
- Provide advanced knowledge on topics in pure mathematics, empowering the students to pursue higher degrees at reputed academic institutions.
- Imbibe effective scientific and/or technical communication in both oral and writing.
- Having problem solving ability- to assess social issues (societal, health, safety, legal and cultural) and engineering problems
- Having adaptive thinking and adaptability in relation to environmental context and sustainable development
- Having a clear understanding of professional and ethical responsibility

### Programme Additional Outcomes

- Continue to acquire relevant knowledge and skills appropriate to professional activities and demonstrate highest standards of ethical issues in mathematical sciences
- Having Sense-Making Skills of creating unique insights in what is being seen or observed (Higher level thinking skills which cannot be codified) (University Elective)
- Articulating ideas and strategies for addressing a research problem.
- Effectively communicating research, through journal publications and conference presentations, to the mathematics community.



- Having critical thinking and innovative skills
- Effectively communicating research, through journal publications and conference presentations, to the mathematics community.
- Having critical thinking and innovative skills

### Programme Special Outcomes

On completion of Integrated M.Sc. in Mathematics (5 yrs.) Programme, graduates will be able to

- Pursue research or careers in industry in mathematical sciences and allied fields.
- Interact with international researchers and developing collaborations.
- Use advanced knowledge on mathematics to pursue higher degrees at reputed academic institutions around the world.

### Programme Core

Mathematics-I, II, Java Programming, Complex Analysis, Linear Algebra, Data Structure (with LAB), Ordinary Differential Equations, Basic Abstract Algebra, Database Management System (**with LAB**), Advanced Real Analysis, Operating System (with LAB), Topology, Linear Programming with LAB, Mathematical Modelling and Simulation, Partial Differential Equations, Fluid Dynamics, Fuzzy Set Theory and Applications, Nonlinear Programming, **Functional Analysis**.

### Programme Elective

Theory of Computation, Transform Technique, Mathematical Finance, Future Options and Derivatives, Probability and Statistics, Scheduling Techniques, Dynamical systems, Optimization techniques, Advanced Algebra, Mathematical Imaging Techniques, Robotics and Control, Discrete Mathematical Structures, Combinatorial Optimization, Measure and Integration, Stochastic methods in industry, Soft Computing, Numerical Analysis, Applied Cryptography, Mathematical Theory of Games, Advanced Numerical methods, Marketing Management, Finite element method and applications, Mathematical Ecology, Mathematical Theory of Games, Introduction to coding Theory, Wavelet Analysis, Distribution Theory, Sobolev Spaces, General Theory of Relativity and Cosmology, Magneto hydrodynamics, Stochastic Process, Approximation Theory, Algebraic Number Theory, Calculus of Variations and Integral Equations, Nonlinear Conservation laws, Infinite Dimensional Optimization and Control Theory, Computational Fluid Dynamics, Continuum Mechanics, Algebraic Topology, Introduction to Smooth Manifold, Financial Management, Graph Theory.

**Dual Degree M.Sc. Data Science (5 Year) with Exit Option B.Sc.  
Data Science (3 Year)**

For more information click here <https://vitap.ac.in/bscmsc/>