

P.M.B. GUJARATI SCIENCE COLLEGE, INDORE

ACADEMIC PROGRAMMES

Undergraduate Programmes Offered

- 1) B.Sc. Biology group (Botany, Zoology, Chemistry)
- 2) B.Sc. Maths group (Physics, Chemistry and Mathematics)
- 3) B.Sc. with Computer Science (Computer Science, Physics, Mathematics)
- 4) B.Sc. with Information Technology (IT, Electronics, Mathematics)
- 5) B.Sc. with Electronics (Electronics, Physics, Mathematics)
- 6) B.Sc. with Microbiology (Chemistry, Zoology, Microbiology)
- 7) B.Sc. with Biotechnology (Chemistry, Botany, Biotechnology)
- 8) Bachelor of Computer Applications (BCA)

Postgraduate Programmes Offered

- 1) M.Sc. Botany
- 2) M.Sc. Chemistry
- 3) M.Sc. Zoology
- 4) M.Sc. Physics
- 5) M.Sc. Mathematics
- 6) M.Sc. Microbiology

Recognized Research Centres (for Ph. D)

The institute is recognised by Devi Ahilya Vishwavidyalaya, Indore, as a research centre for:

- 1) Botany
- 2) Chemistry
- 3) Zoology

UNDERGRADUATE PROGRAMMES

NAME OF PROGRAMME : B.Sc

Programme Outcomes

Bachelor of Science (B.Sc.) offers theoretical as well as practical knowledge about different subject areas. These subject areas include core subjects like Physics, Chemistry, Mathematics, Botany, Zoology and other fields depending on the specialisation a student opts, viz. Computer Science, Information Technology, Electronics, Microbiology and Biotechnology.

This programme course is most beneficial for students who have a strong interest and background in Science and Mathematics.

The outcomes of the B.Sc. programme are:

- The B.Sc. programme helps to develop scientific temper and is beneficial for the society as the scientific developments help in the development of the society.
- After the completion of this course students have the option to go for higher studies i.e. M. Sc and then take up research for the welfare of mankind.
- Students, after this course, have the option to join Indian Civil Services as IAS, IFS, etc.
- This course also offers opportunities for serving in Indian Army, Indian Navy, Indian Air Force as officers.
- Science graduates can go to serve in industries or may opt for establishing their own industry.
- Students can also find employment in government sectors.

Programme Specific Outcomes

1) B.Sc. Biology group (Botany, Zoology, Chemistry)

- B.Sc. Biology students are able to acquire knowledge regarding Botany, Zoology, Chemistry (along with Foundation subjects like English, Hindi, Entrepreneurship, Environmental Science, Computer Basics)
- They are able to correctly use biological instrumentation and proper laboratory techniques.
- By studying Botany, students understand the nature and basic concepts of plant cell biology and the principles of evolution and ecology. They study Mendelian and molecular genetics, cell structure, cell physiology, molecular processes of cells, etc.
- By studying Zoology, students gain knowledge and skill in the fundamentals of animal sciences, They study animals of different phyla, evolutionary processes, basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology.
- By studying Chemistry, they acquire knowledge of chemical thermodynamics, kinetics, electrochemistry, atomic structure, organic chemistry, spectroscopy, etc. They develop skills in different chemical analytic techniques and their industrial applications.
- Students can opt for post-graduation in Botany, Zoology, Chemistry, Fisheries, Seed Technology, Horticulture, Biotechnology and Microbiology.
- They can go for Indian Forest Service and other competitive examinations.
- With a Chemistry background, students opt for pharmaceutical industry jobs
- self-employment in the fields as: mushroom cultivation, organic manure preparation, the horticultural plant production, cultivation of crops in poly house condition, plant tissue culture laboratories, etc.
- With a Zoology background, they get employment in the fields as: sericulture, apiculture, fisheries animal tissue culture laboratories, etc.
- Some even opt for the teaching profession.
- Since these are core subjects possibilities are always more in government jobs too.

2) B.Sc. Maths group (Physics, Chemistry and Mathematics)

- B.Sc. (PCM) students are able to acquire knowledge regarding Physics, Chemistry and Mathematics (along with Foundation subjects like English, Hindi, Entrepreneurship, Environmental Science, Computer Basics)
- By studying Physics, these students acquire a scientific knowledge of the core physics principles in Mechanics, Electromagnetism, Modern Physics, and Optics.
- By studying Chemistry, they acquire knowledge of chemical thermodynamics, kinetics, electrochemistry, atomic structure, organic chemistry, spectroscopy, etc. They develop skills in different chemical analytic techniques and their industrial applications.
- By studying mathematics, they are able to demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus.
- Post-graduation in any of the three subjects in the group, Physics, Chemistry, Mathematics, is always an option.
- Students targeting defence services also stand a chance if they have opted for these subjects, especially in case of Air Force, since we have an NCC Air Wing in the college.
- Some even opt for the teaching profession.
- Since these are core subjects the possibilities are always more, even in government jobs.

3) B.Sc. with Computer Science (Computer Science, Physics, Mathematics)

- B.Sc. (CS) students are able to acquire knowledge regarding Physics, Mathematics and Computer Science (along with Foundation subjects like English, Hindi, Entrepreneurship, Environmental Science, Computer Basics)
- By studying CS as one of the subjects, students learn to computer programming, to apply algorithmic, mathematical and scientific reasoning to a variety of computational problems. Students will be able to apply mathematical and computing theoretical concepts in solution of common computing applications, such as computing the order of an algorithm.
- By studying Physics, these students acquire a scientific knowledge of the core physics principles in Mechanics, Electromagnetism, Modern Physics, and Optics.
- In Mathematics, they are able to demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus.
- On completion of the B.Sc. with Computer sciences as one of the subjects, students are able to: serve as programmers, work as the hardware designers with the knowledge of networking concepts, give technical support for the various systems, serve as web designers with latest web development technologies, work as consultants and management officers for system management, etc.
- They can pursue a post graduation in CS, Physics, Maths, and even MCA.
- An integrated Ph.D programme is also an option. These open avenues for further research and jobs.
- Even a graduate has possibilities of jobs in companies as TCS, Wipro, and HCL etc.
- Students targeting defence services also stand a chance if they have opted for these subjects, especially in case of Air Force, since we have an NCC Air Wing in the college.

4) B.Sc. with Information Technology (IT, Electronics, Mathematics)

- B.Sc. (IT) students are able to acquire knowledge regarding IT, Mathematics and Electronics (along with Foundation subjects like English, Hindi, Entrepreneurship, Environmental Science, Computer Basics).
- By studying IT as one of the subjects, students are able to design, implement, and evaluate a computer-based system, process, component, or programmes to meet desired needs and to effectively integrate IT-based solutions into the user environment.
- In Electronics, students study Digital electronics, Analog electronics, Data structure, Programming languages, Quantum mechanics, Mathematics, Statistics, Network analysis, Fundamentals of electronics, and electromagnetic, etc.
- By studying mathematics, students are able to demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus. They can apply knowledge of computing and mathematics appropriate to the discipline
- On completion of the B.Sc. with IT as one of the subjects, students are able to work as IT Sales and Marketing person, serve as IT Officers in Banks and cooperative societies, give technical support for the various systems, serve as web designers with latest web development technologies, work as consultants and management officers for system management, etc.
- Post-graduation in any of the three subjects in the group, IT, Electronics, Mathematics is always an option.
- Students targeting defence services also stand a chance if they have opted for these subjects, especially in case of Air Force, since we have an NCC Air Wing in the college.

5) B.Sc. with Electronics (Electronics, Physics, Mathematics)

- B.Sc. (with Electronics) students are able to acquire knowledge regarding Physics, Physics, Mathematics (along with Foundation subjects like English, Hindi, Entrepreneurship, Environmental Science, Computer Basics)
- In Electronics, students study Digital electronics, Analog electronics, Data structure, Programming languages, Quantum mechanics, Mathematics, Statistics, Network analysis, Fundamentals of electronics, and electromagnetic, etc. The course introduces students to the fundamentals of electrical circuits such as transistors, vacuum tubes, integrated circuits and diodes.
- By studying Physics, these students acquire a scientific knowledge of the core physics principles in Mechanics, Electromagnetism, Modern Physics, and Optics.
- By studying Mathematics, they are able to demonstrate basic manipulative skills in algebra, geometry, trigonometry, and beginning calculus.
- Completion of B.Sc. with Electronics as one of the subjects, opens avenues in the hardware industry and PG in Telecommunications, Physics, and further studies in Maths, Physics, and MCA. students can seek employment in various public and private sectors as Electronics and Communication Consultant, etc
- Defence services, government sector jobs, telecommunication jobs, hardware industry related jobs etc are open for them .

6) B.Sc. with Microbiology (Chemistry, Zoology, Microbiology)

- B.Sc. Microbiology students are able to acquire knowledge regarding Chemistry, Zoology, Microbiology (along with Foundation subjects like English, Hindi, Entrepreneurship, Environmental Science, Computer Basics).
- Microbiology, involves the study of microorganisms with particular emphasis on the biology of bacteria, viruses, fungi and protozoan parasites. The curriculum is designed to educate students in a variety of important microbiological disciplines and develop technical skills and competencies. Students learn about the theoretical basis of the tools, technologies and methods common to microbiology; and demonstrate practical skills in the use of tools, technologies and methods common to microbiology.
- By studying Chemistry, students acquire knowledge of chemical thermodynamics, kinetics, electrochemistry, atomic structure, organic chemistry, spectroscopy, etc. They develop skills in different chemical analytic techniques and their industrial applications.
- By studying Zoology, students gain knowledge and skill in the fundamentals of animal sciences, They study animals of different phyla, evolutionary processes, basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology.
- Students can opt for post-graduation in Microbiology, Chemistry, and Zoology.
- The scope of Microbiology is in various fields such as agriculture, dairy industry, water industry, pharmacy, medicine, clinical research, bio-nanotechnology, etc.
- With a Chemistry background, students opt for the pharmaceutical industry as a job opening.
- With a Zoology background, they get employment in the fields as: sericulture, apiculture, fisheries animal tissue culture laboratories, etc.
- Some even opt for the teaching profession.

7) B.Sc. with Biotechnology (Chemistry, Botany, Biotechnology)

- B.Sc. Biotechnology students are able to acquire knowledge regarding Chemistry, Botany, Biotechnology (along with Foundation subjects like English, Hindi, Entrepreneurship, Environmental Science, Computer Basics).
- Biotechnology teaches about biological sciences with technologies that manipulate living organisms and biological systems to produce products that advance healthcare, medicine, agriculture, food, pharmaceuticals and environment control.
- By studying Chemistry, students acquire knowledge of chemical thermodynamics, kinetics, electrochemistry, atomic structure, organic chemistry, spectroscopy, etc. They develop skills in different chemical analytic techniques and their industrial applications.
- By studying Botany, students understand the nature and basic concepts of plant cell biology and the principles of evolution and ecology. They study Mendelian and molecular genetics, cell structure, cell physiology, and molecular processes of cells, etc.
- Students can opt for post-graduation in Biotechnology, Microbiology, Chemistry, and Botany.
- The graduates after the successful completion of the programme, have wide scopes in aspects of career wherein they can explore their skills in the areas of pharmaceuticals, medical sectors, agricultural industries, food industries, etc.
- With a Chemistry background, students opt for the pharmaceutical industry as a job opening.
- With a Botany background, they get self-employment in the fields as: mushroom cultivation, organic manure preparation, the horticultural plant production, cultivation of crops in poly-house condition, plant tissue culture laboratories, etc.
- Some even opt for the teaching profession.

NAME OF PROGRAMME : BCA

Bachelors of Computer Applications (BCA)

- After completing the Bachelors of Computer Applications (BCA), students are able to improve their computer literacy, their basic understanding of operative systems and a working knowledge of software commonly used in academic and professional environments.
- They develop criteria to organize and present different type of works in academic and professional environments and acquire the skills to present ideas effectively and efficiently.
- They learn how to organize information efficiently in the forms of outlines, charts, etc. by using appropriate software, to apply the Systems Analysis Design paradigm for critically analyzing a problem.
- They acquire knowledge of programming networking database and web designing.
- They can provide technical support by developing IT-oriented security issues and protocols
- Students of BCA, who can pursue PG in Physics, CS, MCA and this year DAVV, Indore has allowed BCA students to do a PG in Maths as well.
- The course opens up avenues in the hardware industry and PG in Telecommunications, Physics, and further studies in Maths, Physics, and MCA.
- Defence services, government sector jobs, telecommunication jobs, hardware industry related jobs etc are open for them .

Programme Specific Outcomes

1) M.Sc. Botany

- The PG degree provides deep knowledge of subjects as Phycology, Phytochemistry, Forestry, Plant morphology, Phytopathology, Plant anatomy, Plant physiology, Plant genetics, Agronomy, Horticulture, Plant ecology, Plant systematic, Cytology, Genetics, Lichenology, Economic botany, Palynology, Palaeobotany, Bryology, Ethnobotany.
- There are options to work as conservationist, ecologist, horticulturist, environment consultant, plant biochemist, molecular biologist and so on.
- It opens up various job opportunities in the following sectors: Forest Services, Biotechnology Firms, Oil Industry, Land Management Agencies, Seed And Nursery Companies, Plant Health Inspection Services, National Parks, Biological Supply Houses, Plant Resources Laboratory, Educational Institutions.
- Students pursue PhD as well.

2) M.Sc. Chemistry

- A PG in Chemistry opens up avenues for a research in various fields such as pharmaceutical industry, analytical labs, etc.
- Students become abreast with current trends in their subjects. They also gain insights into various areas such Spectroscopy, Photochemistry, Bio-inorganic Chemistry, Photoelectron Spectroscopy, etc. Even job opportunities in these areas are open for them.
- Many PG students have completed their research from our research centre and taken up jobs in academic institutions
- They have career options as : Analytical Chemist, Biochemist, Biomedical Chemist, Chemical Analyst, Chemist, Food & Drug Inspector, Industrial Research Scientist, Lab Chemist.

3) M.Sc. Zoology

Some programme outcomes are :

- Developing deeper understanding of key concepts of biology at biochemical, molecular and cellular level, physiology and reproduction at organismal level, and ecological impact on animal behaviour, elucidation of animal-animal, animal-plant, animal-microbe interactions and their consequences to animals, humans and the environment.
- Development of an understanding of zoological science for its application in medical entomology, apiculture, aquaculture, agriculture and modern medicine,
- Imparting knowledge of cell biology, genetics, and basic recombinant DNA techniques
- Opening avenues in fisheries, apiculture, aquaculture, forestry, etc.
- The course develops an interdisciplinary research and analytical perspective among students. It benefits them in pursuing PhD research work.

4) M.Sc. Physics

- The post graduate programme in Physics develops analytical skills of students, giving them an in depth understanding of core subjects. This is useful for students who wish to pursue their research.
- It is beneficial in interdisciplinary studies as space physics , or medical physics, or nano physics, etc.
- It opens job opportunities in IT sector, aviation industry, space research, DRDO and educational institutes.

5) M.Sc. Mathematics

- Post graduation in Mathematics enables students to learn aspects of pure and applied mathematics
- The programme opens avenues to apply mathematical problems and solutions in a science, technology, business and industry
- A post graduate in Mathematics is equipped with analytical reasoning skills, reasoning skills and logical skills required to qualify various competitive exams.
- Students can utilise their skills in various fields such as Astronomy, Astrology, Education, Finance, Economics, Statistics, Computing and in almost all sciences.

6) M.Sc. Microbiology

- The two years study of Master of Microbiology imparts in-depth understanding of basic aspects of microbiological science.
- The laboratory training in addition to theory is included to prepare them for careers in the industry, agriculture, and applied research where biological system is increasingly employed. Basics and current updates in the areas of Industrial Microbiology, Fermentation Technology, Agriculture & Environmental Microbiology, Medical Microbiology, Bioinformatics, Bio-nanotechnology are included to train the students and also sensitize them to scope for research.
- The Masters in Microbiology programme addresses the increasing need for skilled scientific manpower with an understanding of research ethics involving microorganisms to contribute to applications in the field of microbiology.
- Students gain knowledge of use of microbes in applied fields and solve problems related to the fields of Microbiology.

NAME OF PROGRAMME : Ph.D

Programme Outcomes

The institute is a recognised by Devi Ahilya Vishwavidyalaya as a research centre for Botany, Chemistry and Zoology.

The Ph.D programme encourages professional development in the chosen area through in depth knowledge, hands on training and preparing students for advance research.

The Ph.D programme starts with a course work which includes papers in research methodology, computer skills, literature survey and reviews and synopsis writing.

On completion of this programme students are trained in basic computer skills to be able to use computers for their research literature search data interpretation, thesis typing and presentation and publication of scientific data.

On successful completion of course work students are the registered on a topic of their choice and available facilities to carry out research work which on completion is submitted as a thesis.

Students who have done their PhD research in our research centres have acquired in depth knowledge and competence in their subjects which has enabled them to crack state and national level competitive exams.

Subject experts who are appointed as externals for the PhD viva voce of candidates, strengthen our academic and industry linkages.

Course Outcomes

M.Sc. Microbiology

Course title: Bacteriology

- This course provide detailed understanding of general bacteriology and techniques for isolation of pure cultures of bacteria
- It demonstrates theory and practical skills in aseptic techniques and teaches to perform routine culture handling tasks safely and effectively

Course title: Virology, Mycology and Phycology

- This course provides structure and properties of viruses, fungi and algae.

Course title: Immunology

- This course provides insight into defence system of human body and natural mechanism of protection from disease.
- It deals with the salient features of antigen antibody reaction & its uses in diagnostics and various other studies.

Course title: Microbial Biochemistry

- The course gives an overview of major biomolecules: carbohydrates, lipids, amino acids, enzymes and vitamins - their classification, structure, functions

Course title: Microbial Genetics

- This course provide detailed understanding of DNA replication, mutations, transcription, translation and gene transfer mechanisms.

Course title: Microbial Physiology

- This course imparts knowledge on bacterial photosynthesis, respiratory metabolism, lipid metabolism, metabolism of amino acids and metagenomics.

Course title: Instrumentation

- This course provide detailed knowledge of tools and technique used for detection and measurement of biological molecules and their functions

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Course title: *Bioprocess Technology*

- The course deals with industrial microbiology & fermentation technology

Course title: *Molecular Biology & Genetic Engineering*

- This course provide detailed understanding of recombinant DNA technology and its use in modern biology.

Course title: *Medical Microbiology*

- This course emphasizes on role of microbes in disease establishment and their control and prevention.
- It provides learning opportunities in the basic principles of medical microbiology and diseases caused by bacteria, fungi, viruses, protozoa, etc.

Course title: *Biostatistics and Bioinformatics*

- This course equip students on analysis of scientific data, *applications of statistics in biological research* and concept of significance.
- It deals with classification of biological databases and their functions, basic concepts of sequence comparison and phylogenetic analysis.

Course title: *Applied Microbiology*

- This course deals with the applied aspects of microbiology including the knowledge about biofertilizers, bioinsecticides, biofuels, bioremediation, biosensors biopolymers and bioleaching.

• *Course title: Pharmaceutical Microbiology*

- This course prepares students for job opportunities in pharmaceutical industry by emphasising on microbiological techniques involved in pharmaceutical industries
- It helps to acquire knowledge of GMP practices, understanding of microbiological assays of growth promoting and growth inhibiting substances, molecular principles of drug targeting and drug development in pharmaceutical process

Course title: Food and Dairy Microbiology

- This course provide use of microbes in fermented foods and dairy products, food preservation, food infections.
- It imparts knowledge on microbiological examination of food and milk.

Course title: Environmental Microbiology and Phytopathology

- This course imparts knowledge on significance of micro-organisms in various environments like air, soil, water.
- It also provides an insight on plant pathology.

Course title: Bio-nanotechnology and Stem Cell Research

- This course imparts knowledge on properties, synthesis and applications of nanoparticles.
- It also provides learning opportunities on stem cell technology.

