INDIAN INSTITUTE OF TECHNOLOGY DHARWAD
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BS-MS (Bachelor of Science and Master of Science) in Interdisciplinary Sciences

Indian Institute of Technology dhArwAD (*the usage of the word "dhArwAD" in this document is according to the "Indianization of Roman script" project guidelines of the Institute*) is offering a unique five-year BS-MS (Bachelor of Science and Master of Science) in the Interdisciplinary Sciences dual degree program with an exit option with a BS degree after four years. This program was launched with a futuristic vision towards the changing landscape of academia and industry in recent times, where the demands of academicians and professionals with multidisciplinary expertise, as compared to those with undiscipline expertise, are observing a surge. It is rare to find professionals with a solid foundational knowledge in all the basic sciences subjects, expertise in one of them, and a sound understanding of an allied engineering discipline. Such individuals are in high demand in both academia and high-end job listings; however, they are rare in supply, especially in India. This dual degree program offered at IIT dhArwAD aims to address this issue by nurturing resourceful, rich individuals with intertwined knowledge in basic sciences and engineering. The program also aligns with the recommendations of the National Education Policy (NEP) 2020.

Goals:
- Preparing students to bridge the gap between basic sciences and allied engineering fields. Finding resource persons with skills to bridge the gap between these two fields is rare in academia and industry, and they are in high demand. This dual degree program is specifically designed to train students in sciences and engineering to fulfill this demand.
- Preparing students to take leadership roles in academia and industry. As the students of this program have an overall understanding of varied disciplines, they will be able to gain a birds-eye view of any project/enterprise, which is an essential leadership quality.

Special features:
- It is possible for a student to choose Additional Learning Opportunity (ALO) courses during their first three semesters to explore different science domains and gain initial exposure to research opportunities that they can take up in the future.
- Apart from getting a Major degree, a student can obtain an additional Minor degree offered by the Institute, including those from Engineering disciplines, by completing around 30 extra credits. IIT dhArwAD presently offers Minors in Data Science and Artificial Intelligence, Computer Science and Engineering, Energy and Environment, Smart Systems, and Mathematics (except for Mathematics Majors).
- A student may choose courses offered by any department as "Institute electives" or "extra courses" to hone her/his secondary skills in a discipline allied to her/his primary interest.
- The student can also choose a set of program electives to develop her/his profiles and skills in a specific domain of science or engineering. We list some such possibilities with the corresponding relevant core and elective courses for your reference.

Format:
- First three common semesters building a solid foundational knowledge in all branches of basic sciences.
- After three semesters, the student will choose a Major in Biology, Chemistry, Mathematics, or Physics to build expertise in that discipline.
- The intake of students in a particular Major stream is capped at 25% of the total intake in the program for the corresponding batch.

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- Preference of choice, while choosing a Major will be given to students having higher CGPA at the end of three semesters.
- There is an exit option after completing four years in the program with a BS degree with a Major in the chosen Science discipline.
- The student may also choose to continue in the program to obtain a BS-MS dual degree at the end of five years.

Facilities and supports:

- IIT dhArwAD offers a pool of young and excellent science faculty, each of whom is an internationally recognized researcher.
- State of the art laboratories are present on the campus, including a High Power Computing (HPC), where students can perform their internship-related activities or Research and Development projects, etc.
- The science faculty are proactive in helping the students, through their contacts and recommendations, get into excellent internship programs during summer and winter breaks.
- Student mentorship and Faculty Advisors are identified for each batch to address any queries on the program at any stage.

Major	Area of expertise	Relevant courses (core/electives)
Biology	General Biology	Cell Biology and Genetics, Genetic engineering, Molecular Biology of cancer, Molecular Biology, Neurobiology, Metabolism, Immunology, etc.
	Experimental Biology	Above common courses along with Labs and project work in experimental Biology
	Computational Biology	Above common courses along with Biomedical Imaging, Instrumentation, Genomics and Proteomics, Bioinfromatics, etc.
	*Data sciences in Biology	Above common courses with Genomics and Proteomics, Bioinformatics, Calculus, Computer Programming, Advanced Linear Algebra, probability, etc.
Chemistry	General Chemistry	Thermodynamics and Chemical Kinetics, Quantum Chemistry, Transition and Non-Transition Metals, Main Group Chemistry, Organic Reaction and Mechanism, etc.
	Green and Sustainable Chemistry	Energy harvesting and Storage, Synthesis, and characterization of nano-materials, polymer chemistry, catalysis, etc.
	Medicinal Chemistry	Drug design and development, Chemical biology, Enzymatic reactions, etc.
	*Computational Chemistry	Computer simulation of materials and biomolecules, Chemical bonding theories, Statistical mechanics, etc.

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Mathematics	Pure Mathematics	Number Theory, Advanced Algebra, Functional Analysis, Algebraic Topology, Differential Geometry, etc.
	Applied Mathematics	Probability, Numerical Analysis, Computational Mathematics, Ordinary Differential Equations, Partial Differential Equations, etc.
	Statistics	Probability, Statistics, Stochastic Models, Measure Theory, etc.
	Financial Mathematics	Statistics, Stochastic Models, Introduction to Mathematical Finance I, Introduction to Mathematical Finance II, etc.
	*Mathematical Foundation for Data Science, and AI/ML	Calculus, Computer Programming, Advanced Linear Algebra, Graph Theory and Combinatorics, Probability, etc.
Physics	Astrophysics	Relativity & Cosmology, Quantum Mechanics I, Electricity & Magnetism, Atomic & Molecular Physics, Thermodynamics & Statistical Physics.
	Atomic and Molecular Physics	Quantum Mechanics I and II, Statistical Physics, Electricity and Magnetism, Electrodynamics, Theory of Laboratory Techniques, Experimental Techniques, Atomic and Molecular Physics, Spectroscopy, Laser Science and Technology.
	Material science and technology	Quantum Mechanics I and II, Statistical Physics, Condensed Matter Physics, Atomic and Molecular Physics, Theory of Laboratory Techniques, Experimental Techniques, Superconductivity, Magnetic materials, Thin Film Science and Technology, Physics of Solar cells-Silicon Photovoltaics, and 3rd Generation Solar Cells.
	Photonics: Fundamentals and Technology	Electrodynamics, Quantum mechanics I and II, Laser science and technology, Nonlinear Optics, Quantum Optics, Fiber Optics and Communications.
	*Quantum Artificial intelligence, Machine Learning, Natural Learning Process	Quantum Mechanics I and II, Mathematical Physics, Introduction to Probability, Data Analysis, Computer Programming, Artificial intelligence, Machine Learning, Natural Learning Process, Introduction to Quantum Information and Computation.
	Quantum Technologies	Quantum Mechanics I and II, Mathematical Physics, Condensed Matter Physics, Quantum Optics, Introduction to Quantum Information and Computation, Quantum Information Theory, Quantum Computation.

It is recommended to take a Minor in "Data Science and Artificial Intelligence (AI)" alongside if the student chooses this domain.