Profile of the Departments

Department of Architecture

The Department was established in 1993 with a vision to develop professional architects and to promote research and consultancy activities in the areas of architecture, conservation, landscaping, urban design, urban planning etc.

Birla Institute of Technology, Mesra, Ranchi is the only institute in Jharkhand that offers Undergraduate course in Architecture (B Arch) as well as Postgraduate course in Urban Planning (MUP) and PhD level program in Architecture and Planning.

Programmes offered	**Intake**
Bachelor of Architecture (B.Arch) - 5 years (10 semesters)	40
Master in Urban Planning (MUP) - 2 years (4 semesters)	12
Ph.D. programme in architecture and planning	

The 5-year Bachelor Degree in architecture programme is approved by the Council of Architecture, India (COA) and is also approved by All India Council of Technical Education (AICTE).

The Department is recipient of UGC assistance in the form of departmental research support under the special assistance programme (SAP) of the UGC.

Architecture is primarily the art and science of designing spaces for serving the multifarious activities of human beings and for meeting their specific needs in a meaningfully built environment. Architecture uses the philosophic wholesomeness of humanities, the logical rationalism of science, the passionate imagination of art and the inexhaustible resources of technology. It calls for originality, creativity, conceptualization, perception, aesthetic values and a holistic judgment of people, places, objects and events. The course structure is designed to fulfill the above requirements of the profession. Graduate students have found gainful employment in design consultancy and construction sector. Many of our students have opted for higher studies in India and abroad in many related disciplines, such as, urban design, city planning, landscape architecture, conservation and construction management and even other diversified fields, such as, visual design, product design, management and software development related with architecture.

The MUP programme is designed to fulfill the great need of formal training requirement for holistic fulfillment of the duties of urban local bodies in the area of urban development, planning, town planning schemes and implementation of such development plans or living in urban settlements and various tools and techniques used for planning and management of the development process.

Since its inception, the department has contributed to the field of architecture and urban studies through an array of seminars, conferences, workshop and training courses at both national and international level. The department in association with the civil engineering department of the institute is identified as state level research centre/institution for conducting training programme for Capacity Building of Architects / Engineers in Earthquake Risk Management. The Department has signed a MoU with INTACH (Indian National Trust for Art and Culture Heritage) for conservation and upkeep of heritage properties of Jharkhand.

In 2006 the Department started publication of “ABACUS: An Internationally Refereed Bi-annual Journal on Architecture, Conservation and Urban Studies” (ISSN: 0973-8339), which is continued by researches across the globe and gained the reputation over time.

The Architecture Department of BIT, Mesra closely cooperates with many departments of the Government of Jharkhand, notably, in the field of Urban Development, Building Construction and Disaster Management. The Department has conducted seminars and workshops in association with many departments of the Government and provide consultancy as and when sought. Faculty members are actively involved in various committees of the State Government in the Architecture and Planning related activities. They are also resource persons for the various QIP activities of the ‘Administrative Training Institute’ of the State Government at Ranchi.

The Department is involved in development of e-content for six architectural subjects at the under-graduate level the sanctioned project “Development suitable pedagogical methods for various classes, intellectual calibers and e-learning” anchored by IIT, Kharagpur under the ‘SAKSHAT’ scheme of the

Department/School of Architecture to develop content for all six sanctioned architectural subjects as a part of the pilot project.

The faculty members contribute to the development of the subject area through research activities and contribution of papers and articles in national and international journals, and stay abreast with up-to-date academic development through participation in short term courses, seminars, conferences and workshops.

In order to respond to the social obligation, the department regularly provides consultancy in preparation of architectural design schemes, interior design schemes, landscaping schemes, architectural conservation schemes and several social projects along with city development plans.

Students of the Department have won many prizes at the various Zonal and National meets of the National Association of students of Architecture (NASA) over the years. Students win many prizes in national and international competitions as well. The department is ranking among top ten best architectural colleges in the country by Outlook Express through a nationwide survey.

Alumni of the Department are engaged in various top ranking consultancy organizations, and some of them have already established themselves as successful entrepreneur by owning architectural firms. However, some of them have preferred to take up higher studies in India and abroad. Thereby spread the legacy of the Department and the Institute to rest of the world.

Department of Bio-Engineering

The Department of Bioengineering, renamed in 2014, was established in 2002 as Dept. of Biotechnology with financial support from the Department of Agriculture, Government of Jharkhand, with objectives like providing education and training facilities, carrying out application oriented research, developing in-house technologies and promoting consultancy services in various areas of Biotechnology.

Programmes Offered	Intake
B.E. Biotechnology - 4 years (8 semesters)	60
M.Tech. Biotechnology - 2 years (4 semesters)	18
M.Tech. Bio-Medical Instrumentation - 2 years (4 semesters)	18
M.Sc. Biotechnology - 2 years (4 semesters)	30
Ph.D. Programme	

The Vision & Mission of the Department are-

Vision of the Department:

- The Department of Bioengineering has a vision to impart international standard quality education in the field of Bio- science, Bio-technology and Bio-engineering.

Mission of the Department:

- To create state-of-the-art infrastructure for Research and Training in Biotechnology and Bioengineering.
- To provide globally acceptable technical education in Bio- science, Bio-technology and Bio-engineering.
- To nurture graduates for innovation and creativity in the field of Bio- science, Bio-technology and Bio–engineering having ethical and social concern.
- To promote collaboration with Academia, Industries and Research Organizations at National and International level.
- To contribute to socioeconomic development through education and bioentrepreneurship.

The different programmes seek to provide students with education and training in:

- Scientific principles and knowledge underlying advances in bioengineering
- Basic laboratory techniques in research and development
- Legal and intellectual property issues
- Tools involved in bioinformatics, imaging and signal processing
- Skill and attributes important in business and bioenrepreneurship

Further the learning approach encourages team spirit and leadership quality among students to prepare them for challenging careers, including:

- Research positions in laboratories
- Biotech industries including biopharmaceuticals, medical devices
- Careers in biotechnology applications
- Management positions in bioengineering sector
- Careers with Law firms in biotechnology
- Software development and management

Department at a Glance:

- Independent building about 35000 sq. ft.
- 12 well equipped high end research laboratories dedicated to carry out basic and advanced research in the field of Molecular Biology, Genetic Engineering and Cell Biology, Plant and Animal Biotechnology, Microbiology, Biochemistry, Proteomics, Bioinformatics, Bioprocess Engineering, Chemical Engineering, Environmental Biotechnology, Biomedical Instrumentation and Imaging.
- A Center of Excellence (CoE) under TEQIP, Phase II sponsored by World Bank, BTISnet SubDIC Bioinformatics center for Jharkhand.
- More than 50 externally funded projects from funding agencies like DST, DBT, DST-SERB, UGC, AICTE, ICMR, CSIR, NAIP, MoFPI etc.
- A mixed and balanced well recognized faculty members with rich academic and research profile.
- All faculties with minimum Doctoral degree. Dept. provides high end computational software/ platform for students.

Department of Chemical Engineering & Technology

The Department of Chemical Engineering & Technology with well qualified faculty provides high standard of education in the diversified fields of Chemical Engineering and Chemical Technology. The Department received national recognition by winning the Gold Trophy for Plasticon Award 2012 in the category of Best Educational Institution Contributing to Plastics. The Plasticon Award was conferred on 1st February 2012, at 8th International Plastics Exhibition and conference. The programme was supported by Ministry of Chemicals and Fertilizers, Department of Chemicals and Petrochemicals, Government of India. Faculty members are working on sponsored projects and collaborative research with various organizations. The Department is also recognized under DST-FIST. Department is recipient of a major grant from Ministry of Food Processing Technology, Govt. of India, for infrastructure development for programmes in Food Technology.

Programmes Offered	Intake
B.E. in Chemical Engineering - 4 years (8 semesters)	60
B.E. in Chemical Engineering (Plastic and Polymer) - 4 years (8 semesters)	60
M.E. in Chemical Engineering - 2 years (4 semesters)	18
Integrated M.Sc. in Food Technology - 5 years (10 semesters)with exit option after three years	20
Ph.D. Programmes	

Vision of the Department:

The Department of Chemical Engineering & Technology aspires to be a centre of excellence for the provision of instruction, teaching, training, and research in the areas of chemical engineering & polymer science and engineering. It aims to advance and disseminate knowledge in the above areas, provide an enriched academic environment in undergraduate and graduate education, build partnerships and collaborative relationships, and respond to the growing needs of society.

Mission of the Department:

The mission of the Department of Chemical Engineering & Technology is to educate and prepare students with critical thinking skills in the areas of chemical engineering & polymer science and engineering, for national and international positions in industry, academia and government; to develop and transmit new knowledge in these areas; to serve as a knowledge and service base to the nation; and to provide guidance and leadership in the solution of technical and socio□economic problems.

The undergraduate programme BE (Chemical Engineering) imparts high standard training, emphasizing on Chemical Engineering fundamentals - Heat Transfer, Mass Transfer, Fluid Flow, Process Control, Reaction Engineering, Computer Aided Engineering etc to groom them to carry out economic and environment friendly design, technology development and operation of a wide range of chemical plants – Industrial chemicals, petroleum, polymers, pharmaceuticals, cement, fertilizer, fuel, processed food etc. The core curriculum is complemented by electives in the important emerging areas like NanoTechnology, BioTechnology, Food Technology, Polymer Engineeing, Energy Engineering etc.

In addition to the core Chemical Engineering subjects, students of BE (Chemical Engineering – Plastics and Polymers) programme are exposed to courses in Polymer Materials Technology, Polymer Processing, Polymer Product Design and Development in order to serve industries involved in polymer manufacture, polymer processing and conversion industries, polymer science research and development organizations.

The M.E.(Chemical Engineering) programme deals with topics on advanced Transport Phenimena, Reaction Engineering, Themodynamics along with elective courses on Polymer Processing, Specialty Polymers, Nano-science and Nanotechnology, Plant Design, Surface Engineering

The M. Tech (Polymer Science and Engineering) programme aims to groom students and for advanced level research in the field of polymer science and engineering.

Food Processing Industry in India is growing at a very fast pace. Envisaging a great demand for qualified food technologists in our country, From 2014 academic year following programmes in the area of Food Technology has been introduced, with support from Ministry of Food Processing Industries: (a) 5 year Integrated M.Sc.(Food Technology) , with exit option after three years, and (b) MSc. (Food Technology). The courses include training in the area of Food Composition and Chemistry, Food Biochemistry and Human Nutrition, Food Microbiology, Food Plant sanitation, Food Analysis and Quality Control, Food Preservation and Processing Technology, Chemical Engineering unit operations in Food Processing Industries, Food Packaging, Post-Harvest Technology etc.

The Department also offers facilities for Ph. D. programme in fields of Chemcial Engineering, Polymer Sciene and Technology, Food Technology.

Apart from standard Chemical Engineering laboratories like Fluid Flow, Heat Transfer, Mass Transfer , Reaction Engineering, Process Control etc. the Department of Chemical and Polymer Engineering has state of the art facilities for Post Graduate and Doctoral Research in Reaction Engineering, Instrumental Analysis of chemicals and Polymer, Polymer Processing, Product Development Laboratory etc. The major facilities include computer controlled reactors, Haake Minilab Micro Compounder and Haake Minilab micro injection Moulding, Air Bearing Rotational Rheometer, Malvern, HAAKE Torque Rheometer with Mixer and Extruder, Oscillating Disc Rheometer, Instron Tensile Testing machine, ATLAS accelerated weathering system, Dynamic Mechanical Thermal analyzer (TA), Gas Chromatograph. The Polymer Processing and Product development facilities include Injection Moulding machines - 80 ton L&T Ergotech and 25 ton Windsor, Extrusion Blow moulding machine with parison programming, Kolsite Single screw extruder, Kolsite Film blowing plant and PVC pipe Extrusion plant, Two roll mixing mills, Thermoforming, Compression moulding, Welding facilities – Ultrasonic and Hot air, Fused Deposition Modeling system, Stratasys, for rapid prototyping, MCP-HEK vacuum casting machine for prototyping, 3 axis CNC EDM machine etc.

The students are trained in various CAE applications ASPEN Plus, Accelerys -Material Studio for molecular simulation, MATLAB, PROENGINEER, ANSYS, CATIA, FLUENT, POLYFLOW, MOLDFLOW etc. E-learning facility has been created with Paulsons Training Basic Injection Moulding, Simtech, Single Screw Extrusion, and Compounding with Twin Screw Extruder.

Laboratories in the area of Food Technology include Food Processing Laboratory, Food Microbiology Laboratory, Food Analysis Laboratory. The Food Processing Laboratory includes Pulper machine, vegetable dicing machine, Juice Extraction, Homogeniser, Twin Screw Extrusion cooker, Homogenizer, Colloidal Mill, Grinders, Can Body Reformer, Canning Retort, Steam generator, Steam jacketed cooker, Tray dryer, fluidized bed dryer, Vacuum bottle Filling maching, Form Fill and Seal packaging etc. Food Microbiology lab with Autoclave, Laminar flow clean air workstation, BOD incubator has the expertise of microbiological tests of water and food. The Food Analysis and quality Control facilities included Flame photometer, HPLC, Digital colorimeter, NIR Spectral Analyzer, UV-VIS Spectrophotomerer etc. The other required equipment are available in Central Instrumentation Facility are also available. The facilities are being augmented with capability for determination of protein by Kjeldahl method, dietary and crude fibre determination, Fat determination, Food Texture Analysis, Atomic Absorption Spectrophotometry, Spray drying, etc.

RESEARCH AREA:

Nanoparticle synthesis, Catalysts, Advanced Polymer Composites, Alternative Energy, Pollution Control, Water Treatment Technologies, Polymer Blends and Interpenetrating Polymer Networks, Nano filtration Membrane, Recycling of Polymer Waste, Specialty Polymer, Colloids and Interfacial Science, Tissue Engineering, Sensors, Fuel Cell Membrane etc.

Department of Chemistry

The Department was established in 1955 as a support department offering various chemistry courses for the B.E. programmes and other post graduate programmes like M.Tech in Environmental Science & Engineering.

Programmes Offered	Intake
M.Sc. in Chemistry - 2 years (4 Semesters)	15
Integrated M.Sc. in Chemistry - 5 years (10 semesters) with exit option after three years	40
Ph.D. Programme	

The Department has received support under "Fund for Improvement in Science & Technology Infrastructure" (**FIST-2012**) programme of the Department of Science and Technology, New Delhi for NMR and Computational Chemistry facility. Recently we have received the Instruments as well as all the accessories and has been installed. Some specimen tests has also been successfully performed. The facility will be opened for outside and inside the institute. The Department has also received significant funds from World Bank under TEQIP–I which has helped in creating a central Instrumentation Facility with sophisticated instruments like: ICP-AES, AAS, FTIR, GC, UV-Vis, GC-MS, HPLC, HPTLC, DSC, TGA, SEM, AFM and Electrochemical Analyzer. Through the funds obtained from UGC XIth plan the department has developed a state of art Synthesis Lab which caters to the needs of PG students & research scholars. Another research lab has also been developed through institute fund and is successfully running.

The department has quality research programs supported by UGC, SERB-DST, DBT, AICTE, CSIR etc. The faculty members are actively involved in research in the fields of pure and applied chemistry and have various publications in high-impact journals.

The Department runs a post graduate programme **M.Sc. in Chemistry** from Session 2009 and is continuing. This program designed to provide an in-depth knowledge in various aspects of Chemistry relevant to current educational and research prospects in **Organic & Medicinal Chemistry, Environmental & Inorganic Chemistry, Electrochemistry/fuel cells and energy storage device, nanomaterials, biopolymers, Computational/Theoretical and Physical Chemistry.** This curriculum expands not only the scope of traditional chemistry courses but also various interdisciplinary courses by encouraging students to apply various R&Ds, companies and other well-known institutes. The aim of this program is to prepare students for entry into Ph.D. programs, academics, industries and careers in R & D laboratories.

The Department has also started an **Integrated M.Sc. in Chemistry programme** in the year **2011**. This programme lays emphasis on mastering interdisciplinary concepts. Biology, chemistry, mathematics, physics, electronics and computers are intertwined, in lectures and in labs, to achieve a dynamic understanding of a wide range of fundamental principles within the modern scientific method. The result is a community of students trained in, and dedicated to, an interdisciplinary strategy for learning, and ultimately advancing, the many directions of science. Learning the foundations of physical, mathematical and life sciences in an integrated, active-learning classroom has the effect of producing students who are well prepared for delving into diverse areas of research. In addition to meeting disciplinary learning outcomes in biology, chemistry, mathematics, physics and computers, the students develop skills in teamwork, real problem solving, and communication.

Our department conducted workshops for the 10+2 students and teacher by Vigyan Prasar. Recently, we have opened the east zone nodal chapter for Indian Society of Chemists and Biologists (ISCB) at BIT Mesra to develop our department further organizing different national as well as international conferences, workshops and seminars. National conference on recent frontiers of chemical sciences are being planned in 2016-17. Moreover, the department purchased instruments (AUTOLAB Potentiostat/Galvanostat and Peccel Solar Simulator) under the BIT instrument budget 2014-15. Further, some other instruments such as UV-VIS Spectrophotometer, TGA, DTA and DSC, ion selective electrodes, magnetic susceptibility balance, brookefield viscometer and certain Softwares such CHEMOFFICE, ENDNOTE are being proposed to be purchased in 2016-2017. The modernization of all other labs in our department is undergoing and soon to be completed.

Department of Civil and Environmental Engineering

The Department of Civil Engineering was established at BIT Mesra in 1957. The Environmental Science and Engineering Group was established in 2002 and was merged with the Department of Civil Engineering in 2014. Henceforth the Department was renamed as Department of Civil and Environmental Engineering. **Civil Engineering**, as a subject includes a wide range of courses on various topics from those that are of general nature to those that are of utility in daily life. Starting from building of homes and other buildings, to construction of all kinds of infrastructure facilities, the scope of civil engineering is truly massive. It offers a wide reach in bright and promising career opportunities and professional advancement. **Environmental Science and Engineering** is an interdisciplinary research wing open for science and engineering degree holders. Students after completing their course in M-Tech Environmental Science and Engineering have been placed in various renowned institutions and organizations such as IISc, Bangalore, TERI, New Delhi, IITs, MECON, Sesa Goa, Lafarge, Coal India and NEERI, Nagpur.

S.No	Programmes Offered	Intakes
1	B.E. in Civil Engineering - 4 years (8 Semesters)	60
2	M.E. in Civil - 2 years (4 semesters) in two specializations a) Soil Mechanics & Foundation Engineering b) Structural Engineering	 12 12
3	M.Tech. in Environmental Science & Engineering - 2 years (4 Semesters)	18
4	Ph.D. Programme	

Vision of the Department:

- To develop quality intellectuals through education, research and motivation so that they could bring a positive contribution to society in the area of civil and environmental engineering.

Mission of the Department:

- To develop professional skills through quality education and research.
- To outreach various sectors of society through interdisciplinary programmes and practical oriented approach.
- To create dynamic, logical, and effective leaders with inspiring mind sets.

The Department offers the following courses:

I. Undergraduate Programmes

The Department offers a B.E. in Civil Engineering and is one of the few in the country offering a course in Disaster Management with special focus on Earthquake Engineering at the undergraduate level.

II. Postgraduate Programmes

The Department of Civil & Environmental Engineering at BIT Mesra offers M.E./M.Tech Programmes in the following specialized disciplines:

- M.Tech. in Environmental Science & Engineering
- ME Soil Mechanics & Foundation Engineering
- ME Structural Engineering

III. PhD Programmes (Soil Mechanics and Foundation Engineering, Structural Engineering, Hydraulics and Water Resources, Transportation Engineering, Phytoremediation, Arsenic Analysis, Waste Treatment, Ecosystem Services, GIS, Pollution Modeling and various other branches of Civil Engineering and Environmental Science & Engineering).

M.Tech. in Environmental Science & Engineering

The major courses on M-Tech ESE programme are Air Pollution and Control, Water and Wastewater Treatment & Management, Remote Sensing and GIS, Ecology, Energy dynamics, Solid Waste Management, Climatology, System Engineering, ISO 14000 EMS, Industrial Pollution Control, and EIA.

Programme Educational Objective

a) To impart students with strong knowledge base through theory courses and sessional that makes them suitable for industries, academics, research and consultancies.
b) To develop students analytical, computational and research skills through assignments, weekly presentations and modeling software.
c) To train the students on developing practical, efficient and cost effective solutions on problems and challenges on environmental sciences and engineering.
d) To inculcate among students sensitivity towards social and corporate responsibilities.

Programme Outcomes

i. To develop environmental scientists and engineers and sensitize them towards environmental issues.
ii. To acquire analytical skills in assessing environmental impacts through a multidisciplinary approach.
iii. To identify environmental problems and solutions through organized research.
iv. To improve the communication and writing skill so as to face the competitive world

M.E. in Structural Engineering
Programme Educational Objective

1. To Provide the analytical expertise to create, analyse, formulate, and solve complex and challenging problems in the field of structural Engineering; and also recognize and develop the necessary and suitable tools for the same.
2. To enrich research and practices, by inspiring the leaders of tomorrow to take on the challenge with ease and confidence.
3. To Develop attitude of lifelong learning for becoming an expert in the field of structural Engineering.
4. Implant sensitivity towards ethics, public policies and their responsibilities towards the society.

Programme Outcomes

The Students will develop an ability

1. To be competent in applying systematic rigor to understanding an engineering problem, exploring its background, investigating possible solution methodologies and comparing their merits and demerits.
2. To adept at the use of the appropriate modern tools to rapidly prototype and deploy efficient solutions to real life problems. In doing so he should demonstrate sufficient knowledge of competing tools and their relative merits and demerits
3. To demonstrate the traits of learning and unlearning throughout his professional career, and be willing to learn new techniques, methods and processes.
4. To be sensitive to social, legal and ethical concerns and tune his knowledge to be a responsible engineer adhering to all established practices of his profession. She/he will display special concern for devising environment friendly solutions that shall make a positive impact on society.

ME Soil Mechanics & Foundation Engineering
Programme Educational Objective

1. To provide the technical knowledge to analyze and design foundations for any structure and also solve challenging problems in the field of soil mechanics
2. To make them understand the commitment to professional ethics
3. To develop an interest for pursuing advanced study and continuing education
4. To demonstrate a career path that shows development as a leader and makes them sensitive to their responsibilities towards the society.

Programme Outcomes

The Students will develop ability

1. To identify, formulate, and solve engineering problems and to design and conduct experiments as well as to analyze and interpret data
2. To use the techniques, skills, and modern engineering tools necessary for engineering practice
3. To design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. To communicate effectively

B.E in Civil Engineering Programme
Educational Objective

1. Attain the analytical expertise to create, analyze, formulate, and solve challenging problems in the field of Civil and Environmental Engineering; and also recognize and develop the necessary and suitable tools for the same.
2. Develop technical and management flair to take responsibility for engineering projects and research programs significantly.
3. Uncover multidisciplinary approach and co-relate engineering issues to social and human background in broader sense, in which their engineering helping hand will be utilized.
4. Develop attitude of lifelong learning for becoming successful Civil engineers and Environmentalists.

5. Implant sensitivity towards ethics, public policies and their responsibilities towards the society.

Programme Outcomes

1. A graduate will demonstrate a fundamental understanding of the basic sciences, mathematics and engineering concepts by applying them to engineering problems of varying degrees of complexity.
2. A graduate shall be equipped in designing efficient solutions for complex engineering problems, while complying with all established social, medical, environmental norms.
3. A graduate will be trained as a team player, well versed in understanding the dynamics of working in a team, in leading when necessary and comfortable working across the globe.
4. A graduate shall be sensitive to social, legal and ethical concerns and tune his knowledge to be a responsible engineer adhering to all established practices of his profession. She/he will display special concern for devising environment friendly solutions that shall make a positive impact on society.
5. A graduate will be articulate in his presentation, oral, written and graphical. He will convey his designs in unambiguous and clear terminology use accepted documentation tools and provide instructions which are easily interpretable.

6. A graduate will demonstrate the traits of learning and unlearning throughout his professional career, and be willing to learn new techniques, methods and processes.
7. A graduate shall determine the financial aspects of a project with sufficient reliability make effective cost estimates and convey achievable timelines for his projects.

Department of Computer Science & Engineering

The Department of CSE was established in the year 1983 and is now recognized as one of the leading departments with infrastructure and facilities to match the very best in the country. The department remains committed towards its mission which is twofold. One is to provide students with the fundamental knowledge and problem solving skills in Computer Science required for a fulfilling career. The other goal is to create and disseminate knowledge to improve Computer Science research, education and practice.

The department currently offers the following programmes, all of which are accredited by the All India Council for Technical Education (AICTE).

Programmes Offered	**Intake**
B.E. in Computer Science & Engineering - 4 years (8 semesters)	120
B.E. in Information Technology - 4 years (8 semesters)	60
Master of Computer Applications (MCA)- 3 years (6 semesters)	60
M.E. in Software Engineering - 2 years (4 semesters)	15
M.Tech in Computer Science & Engineering - 2 years (4 semesters)	16
M.Tech in Information Technology - 2 years (4 semesters)	18
M.Tech in Information Security - 2 years (4 semesters)	18
Ph.D. Programme	

Mission of the Department:

- To impart quality education and equip the students with strong foundation that could make them capable of handling challenges of the new century.
- To maintain state of the art research facilities and facilitate interaction with world's leading universities, industries and research organization for constant improvement in the quality of education and research.

Vision of the Department:

- The department strives to be recognized for outstanding education and research, leading to excellent professionals and innovators in the field of Computer Science and Engineering, who can positively contribute to the society.

Facilities: The department is equipped with seven laboratories with over 445 computers available for conducting laboratory sessions in diverse topics like in (i) programming languages: C, C++, Java, Oracle.(ii) Matlab for Soft Computing and Image Processing (iii) Rational Rose for Software Engineering and (iv) Laboratories for Networking, Multimedia, Simulation, Parallel Computing etc . All the Laboratories are internally networked allowing students to remotely access any particular resource at any point in time. The Department has recently installed a state of the art Fujitsu High Performance Computing System, which provides for massive computational power and the ability to host an independent cloud computing infrastructure. The installation of the system has put the Department in a very select group in the country having such a computational infrastructure.

Areas of Research: Bioinformatics, DNA Computing, Parallel Computing, Image Processing, Robotics, Intelligent Systems, Rough Sets ,DNA Nanorobotics, Software Engineering, Sensor Networks, Data Mining, Pattern Recognition, Natural Language Processing etc.

Department of Electronics & Communication Engineering

The Department of Electronics and Communication Engineering was established in the year 1960. This is one of the largest departments of the institute, having the highest number of students and the faculty members. Due to its modern infrastructure and exposure given to the students, it is one of the elite departments in India. The ECE department runs the following programmes:

Programmes Offered	**Intake**
B.E. in Electronics & Communication Engineering- 4 years (8 semesters)	120
M.E. in Electronics & Communication- 2 years (4 semesters) in 3 specializations	
a) Instrumentation & Control	12
b) Microwave	12
c) Wireless Communications	18
Ph.D. Programme	

Vision of the Department:

- To become a centre of excellence in teaching and research for creating technical manpower to meet the technological need of the country in the field of Electronics and Communications Engineering.

Mission of the Department:

- To facilitate state of the art education and research at undergraduate, postgraduate and doctoral levels to enable to perform challenging engineering and managerial jobs in the field of electronics and communication engineering.
- To build national capabilities in technology, education and research in emerging areas in the field of Electronics and Communication Engineering.
- To create an environment to provide excellent research and development facilities to strengthen Ph.D. programmes and research projects.
- To provide excellent technological services to bridge the gap between academics and industry in order to fulfill the overall academic needs of the society.
- To provide high quality course structure in order to turn out qualified professionals to meet the engineering needs of the country.
- To develop effective teaching skills and the research potentials of the faculty members.
- To ensure all round development of the students and to create a platform for turning out engineering professionals who can assume leadership position in society.

Bachelor in Engineering

It offers B.E. in Electronics & Communication Engineering, a 4-year (8-semester) programme with intake of 120 students. The students are exposed to all fundamental and advanced technology in the field of Electronics and Communication Engineering. Some of the courses offered are Modern Instruments and Measurements, Microprocessor and Microcontroller, Analog / Digital Communication system, Microwave Engineering, Digital Signal Processing, Intelligent Instrumentation, Computer Networking, Fiber Optics Communication System, Antennas and Propagation for Wireless Communication, Mobile and Cellular Communication, VLSI Design, Embedded system etc. The syllabi are frequently updated to incorporate recent developments. The Department has several well-equipped and advanced laboratories to help students in gaining practical exposure. Almost 100% students are absorbed by various leading industries and organizations by campus placement.

Master in Engineering

The Department is currently running three postgraduate programmes with specializations in (a) Instrumentation with intake of 12, (b) Microwave Engineering with intake of 12 and (c) Wireless Communication with intake of 18 students. A team of expert teachers are involved in teaching and providing research guidance. Students are exposed to several specialized software tools such as Cadence System Design Tools, Silvako Software (Athena & Atlas), IE3D, HFSS, ADS, CST, Microwave Office, Sonnet, Fidelity, Beampro, SystemView, LABView, MATLAB, NS-2 and QualNet etc. The department is recipient of assistance in the form of Departmental Research Support under the Special Assistance Programme of UGC. The department is running several R & D projects from various agencies like UGC, DST, AICTE, ISRO etc.

Ph.D. Programme

The Department runs PhD programme within the field of Electronics and Communications Engineering. Currently the research areas undertaken for the PhD programme are: Fibre Optic Sensors & Communication, Optoelectronic Devices, Wireless Communication, Printed RF & Microwave Circuits, Antennas for various Applications, Electromagnetics, EMI/EMC, Computational Electromagnetics, VLSI &

Embedded System Design, RF MEMS, Biomedical Signal Processing, Speech & Audio Signal Processing, Image Processing, Multimedia & Automation

Department of Electrical & Electronics Engineering

The Department of Electrical Engineering was started in 1955. The B.E. curriculum was redesigned in 1986 to accommodate several Electronics and Computer subjects in order to tune its programmes according to changing requirements and since then it has been renamed as Electrical & Electronics Engineering. The Department is dedicated to the current needs of industry primarily focusing on application of new technology in various fields. As recognition of the activities of faculty members, different agencies like UGC, DST, AICTE, CDAC, TEQIP, etc have sanctioned funds to support the on-going research work.

Programmes Offered	**Intake**
B.E. in Electrical & Electronics Engineering - 4 years (8 semesters)	60
M.E. in Electrical Engineering - 2 years (4 semesters) in 3 specializations	
(i) Control System	12
(ii) Power System	12
(iii) Power Electronics	18
Ph.D. Programme	

Vision of the Department:

- To become, in consonance with the society, an internationally recognized center of excellence in academics, research and technological services in the area of Electrical and Electronics Engineering and related inter-disciplinary field.

Mission of the Department:

- Imparting strong fundamental concepts to students and motivate them to find innovative solutions to engineering problems independently
- Developing engineers with managerial attributes capable of applying latest technology with responsibility
- Creation of congenial atmosphere and excellent facilities for undertaking quality research by faculty and students
- To strive for more internationally recognized publication of research papers, books and to obtain patent and copyrights
- To provide excellent technological services to industry for the benefit of society

Programmes Accredited:

All the above courses are approved by AICTE. B.E. (EEE), M.E. (Control System) and M.E. (Power System) programmes are accredited by NBA. M.E.(Power Electronics) has been applied for accreditation.

Undergraduate Programme:

The emphasis is given on fundamentals of science, mathematics and their application to the solution of contemporary problems. The programme provides ample flexibility to the students to undertake various elective and breadth courses that provide exposure to various disciplines of EEE.

Electives offered:

Computer Aided Power System Analysis, Bio Electronics Instrumentation, Artificial Neural Network (ANN), Advanced Power Electronics, Robotics, High Voltage Engg., EHV Power Transmission, Artificial Intelligence, Soft Computing Techniques, Renewable Sources of Electrical Energy, Testing & Commissioning of Electrical Equipment, Embedded System & its Applications.

List of Breadth Papers:

Environment Psychology, Organisation Behaviour, Industrial Organisation & Management, Financial Management, Business Ethics, Intellectual Property Rights, Entrepreneurship & Small Business Management, etc.

Postgraduate Programmes:

M.E. in Control System:

In M.E. Control Systems Programme focuses on cutting edge control techniques like modern control system, nonlinear control analysis, discrete control techniques, optimal control, robotics, ANN based adaptive control methods, fuzzy logic controllers with advanced model reference learning and stability analysis, etc.

M. E. in Power System:
M. E. Power systems aims at imparting knowledge on advanced analysis techniques, modern tools in power system operation and control, techniques to improve the performance of EHV AC and HVDC transmission, advanced power system protection systems, planning and reliability analysis, technologies involved with renewable energy sources, DSP applications, etc.

M.E. in Power Electronics:
M.E. Power Electronics emphasizes on imparting skilled knowledge of advanced semiconductor devices, power electronic converters, their design and control methodology, dynamics of Electrical Machines, Power Electronics applications, Control of electrical drives etc.

Ph. D. Programme:
Currently a number of research scholars are working in the areas of non-stationary signal analysis, intelligent control techniques applied to Phasor Measurement Unit (PMU), Reliability analysis for power system and its components like PMU, Protection Systems, etc., Multi-Agent System (MAS) modelling, Wide Area Monitoring System (WAMS), Distribution System Planning, Automatic Generation Control and non-linear dynamic systems, Real-time Image processing for robotic application, development of new architecture for neural networks, soft computing based intelligent controller design, Fault diagnosis of 3 – φ Induction motor, bi-directional dc-to-dc converters, matrix converter, resonant converter, current source inverter for hybrid electric vehicles, control of induction motor drive, three-phase and multi-phase PM BLDC drive, estimation and identification of plants.

Research Activity:
The faculty members of the department (with different specializations) actively pursue research with funding from various national agencies like UGC, AICTE, DST. The current areas of research include Laboratory Prototype of Smart Grid, digital relaying of transmission using DSP techniques, reliability analysis, generation scheduling, distribution systems planning, voltage stability analysis, Fault tolerant permanent magnet drives, Energy Storage and Management, Grid Interactive Solar Photovoltaic System, Microgrid, bi-directional converters for contactless energy exchange, Image processing applied to vehicular traffic surveillance system, etc.

The research outputs are published in reputed journals like IEEE transactions, IET Proceedings, Elseveir, Taylor & Francis, Polish Academy of Science & Tech., IE (I), etc.

The department has also got two patents in the area of power systems.

Collaboration with Industries and Universities:
The department has collaborated with the Texas Instruments, NI, Research and Development Center for Iron and Steel (RDCIS), SAIL, Metallurgical Consultants Limited (MECON), Meditron (Ranchi), etc.

Conventions/Seminars/Conferences/Short-term Training Programmes:
The Department regularly organizes conventions, seminars, conferences short term training programmes/courses under aegis of AICTE- ISTE, TEQIP, UGC (FIST), NaMPET. Specialized courses for industry (SAIL, Indian Railways) have also been organized.
Keeping in view the development of nearby villages, the Department is also involved in conducting short term training programmes in electrical technical skills to youth.

Facility: The department has following well-equipped laboratories;
Basic Electrical Engineering lab., Measurement Lab., Electrical Machines lab., Power Electronics lab., Electrical Drives lab., Control Systems lab., Process Control Lab., Power Systems lab., Smart Grid lab., Digital Signal Processing lab., Simulation lab., Electrical Workshop.
The main equipment in measurement lab are - Optical transducer, thermal transducer, Kelvin double bridge, LVDT setup, strain gauge setup, setup to determine breakdown voltage of transformer oil.
Electrical Machines lab. houses all static and rotating machines like transformer, induction motor, DC motor, DC generator, synchronous generator (alternator) and motor.

The major equipment in power Electronics lab are - device characterization system, AC - DC, DC-DC, DC - AC conversion systems, Programmable signal generators, signal analyzer, etc.
The department is in the process of establishing a drive lab for enhancing research facility in the field of Power Electronics. The main equipment in Electric Drives Lab which is in the process of upgradation consist of single phase and three phase inverter, rectifier, BLDC Motor, DC Motor, three phase induction motor, etc.

The main equipment in Control laboratory include inverted pendulum, Magnetic Levitation System, Twin Rotor MIMO System, bouncing ball apparatus, coupled tank control, mechatronics kit, NI kit and a range of DSP kits. The Process Control lab consists of apparatus for control of level, pressure and flow; both manually and automatically.

The major equipment in Power Systems laboratory include generator protection scheme, static VAR compensator, network analyser, power factor controller, induction type and numerical relays, vacuum air breaker, etc. Smart grid lab is equipped with two-area system; each area is consisting of generator, transmission line and load. Control station is being developed under LabVIEW platform and SCADA software. Department is in the process of procuring PMU for the lab.

The Soft-Computing lab. (DSP lab and Simulation lab) is well-equipped with modern softwares like MATLAB and its toolboxes, LabVIEW, TMS processor kits, ETAP, PSCAD.
In Electical Workshop, students are taught the design of domestic wiring, industrial wiring, direct-on-line starter for 3-phase induction motor, etc.

Department of Mathematics

The Department of Mathematics provides facilities for research work leading to Ph.D. degree in different areas of mathematics. Besides this, the department offers various topics in mathematics to undergraduate and post graduate students of different departments of the institute, also runs its own courses : 5 years Integrated M.Sc. (Mathematics & Computing) and 2-years M. Sc. (Mathematics) . The Department also has its own state of the art Computational Laboratory.

Programmes Offered	Intake
M.Sc. in Mathematics - 2 years (4 semesters)	15
Integrated M.Sc. in Mathematics & Computing - 5 years (10 semesters) with exit option after three years	20
Ph.D. Programme	

Mission of the Department:

- to provide an environment where students can learn and become competent users of mathematics and mathematical applications.
- to conduct research that has worldwide recognition

Vision of the Department:

- to develop and offer dynamic programs in mathematics that helps the students to enter in new emerging fields and specialisations of mathematics.
- to be among the best departments of the country

The faculties of the Department are actively engaged in research in the following areas:

- Cyber Attack, Defence and Crime
- Statistical Analysis of Hindustani Classical Music
- Differential Equations and Difference Equations
- Seismology & Earthquake Engineering
- Computational Solid Mechanics
- Operations Research, Optimisation Techniques
- Fuzzy Optimisation
- Mathematical Models on Infectious Disease, Environment Pollution
- Algorithm Analysis
- Numerical Analysis

Department of Mechanical Engineering

Since its inception in 1955, the Department of Mechanical Engineering has been known for quality teaching and research, it offers. The excellent laboratory facilities, modern computer clusters, systematically designed curriculum, and dedicated faculty members make this Department a dynamic place to study and pursue research in different areas of current interest.

Programmes Offered	Intake
B.E. in Mechanical Engineering - 4 years (8 semester)	90
M.E. in Mechanical Engineering - 2 years (4 semesters) in following specializations: a) Heat Power b) Design of Mechanical Equipment	 12 12
M.Tech in Energy Technology - 2 years (4 semesters)	18
Ph. D. Programmes	

The department has excellent placement record. Mechanical Engineering Graduates from BIT Mesra are sought after by many prestigious companies.

Vision of the Department:

- The Mechanical Engineering Department of Birla Institute of Technology, Mesra, Ranchi strives to be globally recognized for quality engineering education and research leading to well qualified engineers, academicians and researchers who are innovative, entrepreneurial and successful in achieving excellence in their field of study.

Mission of the Department:

- To impart quality education to the students and enhancing their knowledge and skills to be globally competitive Mechanical Engineers.
- To maintain state of the art research facilities to provide its students and faculty to create, interpret, apply and disseminate knowledge with an understanding of the limitations.
- To develop linkages and interaction with industry, R & D organisation and educational institution for excellence in consultancy practices, research and teaching.
- To provide conducive environment for learning, creativity and problem solving skill.

All degree schemes offered are modular and structured to allow a gradual development of knowledge and skill. Students undergo for industrial projects in their last semester of study. The industrial project gives students a chance to apply their engineering skill to real engineering problems. Many professional projects are industrially driven or linked, giving students direct exposure to industry as part of their studies. There is also a strong tutorial system, which provides students with a point of contact with a member of staff who can advise on welfare issues as well. Students regularly participate in various national/international events through various engineering societies like:

1. Team Srijan
2. Firebolt.

The department has Mechanical Engineering Society which takes care of all-round development of the students.

Laboratories in the department

Heat Transfer Lab., Strength of Materials Lab., CAD Lab., Hydraulics and Hydraulic Machines Lab., Theory of Machines Lab., Non-Conventional Energy Lab., Automotive Lab., Advanced Fluid Mechanics Lab., I.C. Engine/Thermal Engg. Lab., Engineering Mechanics Lab. and Computational Lab.

Research Areas: Some of the research areas are:

Composite Materials, Materials Technology, Smart Materials/Composites, Modelling and Simulation
On-Condition health monitoring, Mechanical vibrations, Computational Fluid Dynamics, Heat Transfer
New and Renewable Energy, Design of Thermal Systems, Computer Aided Analysis and Design
Solar Energy, Waste Heat Recovery, I.C. Engines and Gas Turbines, Bio-fuels and Combustion
Fluidics, Plastic Deformation and Fracture, Robotics and CAD/CAM

Department of Pharmaceutical Science & Technology

The Department of Pharmaceutical Sciences & Technology was established in 1972. It offers the following programmes:

S. No.	Programmes Offered	Intake
1	B. Pharm. - 4-years (8-semesters) programme	60
2	M. Pharm. - 2-years (4-semesters) programme in four specializations	
	a. Pharmaceutics	18
	b. Pharmaceutical Chemistry	18
	c. Pharmacology	18
	d. Pharmacognosy	18
	e. Clinical Research	18
	f. Quality Assurance and Regulatory Affairs	18
3	M. Pharms - 2-years (4-semester) programme under QIP	08
4	Ph.D. Programmes (including 8 under QIP)	Flexible

The above programmes are recognized by the Pharmacy Council of India (PCI) and the All India Council for Technical Education (AICTE). The Department is recipient of assistance under the Special Assistance Programme (SAP) of the UGC and FIST of the DST. The Department is also recognized and approved by AICTE as one of the Centres for Quality Improvement Programmes (QIP) for postgraduate and Ph.D. programmes.

The course syllabi are updated frequently to incorporate newer developments in Pharmaceutical Sciences & Technology and also to cater the need of Pharmaceutical Industries, Academic Research and Drug Regulatory agencies. Department has facilities for doctoral research in different areas of Pharmaceutical Sciences. A number of Ph.D. degrees have been awarded besides a large number of scholars, registered for Ph.D. in different disciplines of Pharmaceutical Sciences. The Department has highly qualified and competent academic staff.

The faculties of the Department have been handling several R&D projects sponsored by National (UGC, AICTE, CSIR, DST, ICAR, TRIFED, ICMR, etc.) and International (BMBF/New Indigo/UKIERI) funding agencies.

The Department has sophisticated state of the art laboratories besides a computational & molecular modeling laboratory for teaching and research. Some important facilities and instruments available are:
Differential Scanning Calorimeter (Shimadzu DSC50 & DSC60), ELISA Reader (Perkin-Elmer), Automatic Video Tracking System (Ethovision), Fluorescence Spectrophotometer (Hitachi), Gas
Chromatograph (Chemito Ceres 800 Plus), Gel Electrophoresis System, High Performance Liquid Chromatography (Waters and Knauer), Preparative HPLC (Agilent), High Performance
Thin Layer Chromatography with WINCAT software (Camag), High Speed Refrigerated Centrifuge, FTIR 8400S (Shimadzu), Research Microscope with photomicrography (Carl-Zeiss)
& High Resolution Research Microscope with Digital Camera with PC based screen (Leica), UV-VIS Spectrophotometers 1800 and 2450 (Shimadzu & Systronics), Rotational Viscometer (Wells Brookfield Cone/Plate), Nitrogen and Hydrogen Gas Generator (Claind), Milli Q Water Purification Unit (Millipore), Non – invasive B.P. Instruments (IITC Life Sciences), Plethysmograph (IITC Life Sciences), Microwave Synthesis System (Catalyst 4RI), Lyophillizer (Operon), Rotary Evaporator (Buchi), Probe sonicator, Dissolution Apparatus, Ultracentrifuge, Texture Analyzer, Malvern Viscometer, Nano spray dryer, Humidity chamber (as per ICH), Electromagnetic sieve shaker, Ball mill, Ultra turrax digital homogenizer, etc.

An overview of different areas of research at the Department is as follows:

Pharmaceutics group
New drug delivery system: Controlled release formulations, Transdermal drug delivery systems; Development of nasal delivery system; Colon targeted drug delivery system, self-emulsifying drug delivery system. Thermodynamic approach to drug excipient interactions, Cosmeceuticals (cost-effective skin care poly-herbal formulations), Nanotechnology based formulation development, Exploration of Natural Gum as Pharmaceutical Adjuvants and Standardization of Ayurvedic Drug/Polyherbal Formulations.

Pharmaceutical Chemistry group
In-silico design, synthesis (microwave, combinatorial solution phase synthetic techniques) and evaluation of novel candidate compounds with special reference to antimicrobial, antiprotozoal, antiviral, antiHIV, anticancer, analgesic, antihistaminic, anticonvulsant, cardiovascular, antidiabetic and other activities. Isolation and characterization of natural products using spectroscopic methods (UV-VIS/IR/NMR/MS etc.) besides studies on synthetic nutraceuticals, Molecular modeling, docking, QSAR and solution phase ADME studies using CADD based software like Maestro Glide, BioSolveIT FlexX, Sybyl 7.1, and Scigress Explorer.

Pharmacognosy group
Validation of traditional systems of medicine, validated methodologies for development of new herbal formulations, microcomputerized identification of indigenous drugs & development of standards, development of drug molecules from natural sources and their enhancement by biotechnological approaches, exploring natural resources for novel drug delivery systems.

Pharmacology group
Anti tumor & immunomodulatory studies of compounds from synthetic and natural sources, general pharmacological screening of new moieties from synthetic and natural sources, toxicological studies of bioactive molecules (natural and synthetic sources), neuropharmacological studies of bioactive molecules, studies of bioactive molecules on experimentally induced urolithiasis, nephropathy, neuropathy and diabetes in animal models, biochemical and molecular pharmacological studies of bioactive molecules.

The Department maintains a well-equipped animal house, which is accredited by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA). The Department also has a Medicinal Plant Garden spread over 10 acres of land within the Institute Campus. More than 200 plants of medical and aromatic importance have been cultivated and are being maintained in the Herbal Garden. A few aromatic oils such as Citronella (Java), *Cymbopogon martinii*, *Mentha arvensis*, *Mentha piperita*, *Eucalyptus citriodora*, Lemon Grass, are extracted from time to time.

The Department also extends support to other Departments like- Bio-Engineering, Chemical Engineering & Technology, Applied Chemistry, Environmental Science & Engineering, Medical Lab Technology at the University Polytechnic, Hotel Management & Catering Technology and other engineering departments.

Department of Physics

The Department of Physics (previously known as Department of Applied Physics) since its inception in 1955 has played a pivotal role in the institute. A gamut of very motivated, well qualified and talented faculty is actively engaged in teaching as well as research in areas of theoretical and experimental physics. They have, to their credit, numerous research publications and several R&D projects. Some faculty members have been awarded international fellowships from Universities abroad and some have received BOYSCAST fellowship awarded by DST, Government of India.

Programmes Offered	Intake
Integrated M.Sc. in Physics - 5 years (10 semesters) with exit option after three years	40
M.Sc. in Physics - 2 years (4 semesters)	15
Ph.D. Programme	

Vision of the Department:

- The vision of the Department is to achieve excellence in undergraduate and postgraduate education and research for scholarly inquiry and development of new knowledge.

Mission of the Department:

- To train the students to become lifelong learners who will contribute to the creation of new knowledge, new technology, and innovation through excellence in research in emerging areas.
- To educate students to become future leaders in science, technology, industry, education and other professions and succeed in a globally competitive environment.
- To create National and International collaborations for research engagement in strategic areas of research.
- To provide beneficial service to local, state, national and international communities.

The prime objectives of the offered programmes are as follows:

- Impart high quality education in a vibrant academic ambience.
- Prepare students to take up challenges as researchers in academic and R & D organizations.
- To train students for participation in multidimensional academic activities.
- To impart scientific knowledge and inculcate human values.

The department has well equipped laboratories having several systems viz., RF magnetron sputtering, Plasma Enhanced Chemical Vapour Deposition, thermal CVD, RF/DC magnetron co-sputtering, plasma nitriding, Raman spectrometer, nanoindenter, solar simulator, D33 meter, PE loop-tracer, UV Visible Spectrometer, 10K cryostat etc.

At present the department has 13 faculty members and 15 research scholars. The department has been pursuing several sponsored projects funded by the UGC, DST, BRNS, ARDB, and NRB. In addition, recently the department has also completed two Indo-Russian, one Indo-German and an Indo-Israel projects. The Department has received “Fund for Improvement in Science & Technology Infrastructure (FIST)” from DST, New Delhi, as well as Special Assistance Programme (SAP) from UGC.

The current broad areas of research in the department include nanotechnology, condensed matter physics, quantum optics and nonlinear optics. Specific sub-areas are surface engineering with plasma coating, carbon nanotubes, diamond-like carbon (DLC) films, nano and ultrananocrystalline diamond films, solar cells, colossal magnetoresistive materials, dilute magnetic semiconductors, piezoelectric materials, electronic composite materials, magnetic composites, soliton and light propagation, optical communication, photonic crystal fibres, optoelectronics, etc.

Department of Production Engineering

Department of Production Engineering tries to provide the best quality education to its students and helps them to attain clear understanding of every aspects of today's manufacturing world so that they can meet the demands of growing manufacturing industries. The production engineering is the combination of manufacturing technology and management in planning and controlling the operations of manufacturing system. This programme aims at conveying the knowledge, judgment and skills required to design and improve manufacturing processes and high-performing sustainable production systems. The department has established the links with many industries, R&D organizations, consultancy organizations and academic institutes so as to give opportunity to the students to explore the emerging trends and technologies in the area of production engineering.

Programmes Offered	Intake
B.E. in Production Engineering - 4 Years (8 Semesters)	60
M.E. in Automated Manufacturing System - 2 Years (4 Semesters)	25
Ph.D. Programme	

The structure of courses is made keeping in mind the today's manufacturing trends. The department aims at studies as well as laboratories based on the training programmes, short term courses, workshops, collaboration and support from industry.

Vision of the Department:

- To Become a Centre of Excellence Striving Continuously towards Providing Quality Education, Research and Innovation in the Field of Production Engineering.

Mission of the Department:

- To provide quality education at both undergraduate and post graduate levels.
- To provide opportunities and facilities for research and innovation.
- To produce engineering graduates to meet the demands of manufacturing industries and R&D organizations.
- To emphasize on integrating Manufacturing technology with management.
- To impart latest technological knowledge to students by continuous development of curricula and faculty.

Bachelor in Engineering:

The Department gives the exposure to the undergraduate students to all the fundamental and advanced technology in the field of Production Engineering. Some of the papers offered in the curriculum are Metallurgy, Fluid Mechanics and Hydraulics, Mechanics of Solid, Manufacturing Processes, Design of Machine Elements, Metrology, Theory of Machine, Manufacturing Processes-II, Machine Tool Design, Statistical Quality Control, Work Study & Ergonomics, Tool Design, Material Deformation Processes, Production Planning & Control Manufacturing Automation and Robotics.

The lab courses offered by the department for the undergraduates are Manufacturing Automation & Robotics Lab, Computer Aided Design Lab, Modelling and Simulation LAB, Material Deformation Process LAB, Manufacturing Process Lab, Machine Tool Design Sessional, Work Study & Ergonomics Lab, Machine Design Sessional, Metrology Lab, Metallurgy Lab, Mechanics of Solid Lab.

Master in Engineering:

The Department runs one specialisation course in the post-graduation programme i.e. Automated Manufacturing System. In this course the papers offered are Manufacturing Automation Computer Aided Manufacturing Quality Engineering and Robust Design, Robotics & Robot Applications, Integrated Manufacturing & Resource Planning, Soft Computing in Manufacturing Automation, Planning & Control of Production System, Product Design & Manufacturing.

The various lab courses offered are Computer Aided Manufacturing Laboratory, Computer Aided Design & Drafting Laboratory, and IMS Laboratory/Coursework Manufacturing Simulation Lab. The students are even exposed to some of the specialised softwares such as CATIA, GPSS.

Ph.D. Programmes:

The department also runs the Doctoral research work in the field of production engineering field. The department has the well-equipped laboratories being supported by the central facilities of institutes and central CAD Laboratory to help the researchers to carry out the research work smoothly.
The research areas provided by the department are machining, welding, metal cutting and powder metallurgy, Non-traditional manufacturing, Metal Casting and Powder Metallurgy, Precision Forming, CAD/CAM/ FMS/ Robotics, Product Development and Rapid Prototyping, Design of Manufacturing Systems , Lean and Six Sigma, Green Manufacturing, Planning and scheduling in manufacturing environment, Supply Chain, AI application in Manufacturing Engineering, Quality Engineering and reliability, Work Design and Human Factor Engineering.

Manufacturing Automation: It is the use of control systems (such as numerical control, programmable logic control, and other industrial control systems), in concert with other applications of information technology (such as computer-aided technologies [CAD, CAM, CAX]), to control industrial machinery and processes, reducing the need for human intervention.
In the scope of industrialization, Automation is a step beyond Mechanization. Whereas Mechanization provided human operators with machinery to assist them with the muscular requirements of work, Automation greatly reduces the need for human sensory and mental requirements as well. Processes and systems can also be automated.

Soft Computing: Applications of Soft Computing have recently increased and methodological development has been strong. Soft Computing admits approximate reasoning, imprecision, uncertainty and partial truth in order to mimic aspects of the remarkable human capability of making decisions in real-life and ambiguous environments. It describes the principles and results of industrial applications of Soft Computing methods and introduces new possibilities to gain technical and economic benefits by using this methodology.

Product Design and Engineering: As a product designer engineer, you will design and develop consumer products with a focus on aesthetics, functionality and ergonomics. But your focus will stretch beyond products that look and feel good. Your understanding of the manufacturing process, materials and marketing - namely your engineering skills - is what will set you apart.

What is industrial product design and engineering?
Industrial product design and engineering focuses on hi-tech consumer product design. It integrates the creative skills of engineering (inventiveness and project management) with industrial design - namely aesthetics, manufacturing technologies and graphics.

A professional with these qualifications is often called a Product Design Engineer.
Some product designer engineers focus on the engineering aspects - such as noise and vibration control, high performance composite materials and energy use. However, others focus on their industrial design strengths to develop architectural products, control interfaces, corporate image concepts and other mass-production technologies.

Robotics: The first factor of safety issue is concerned with the support of robots. In olden days, the human workers were mostly affected by diseases, while working on hazardous workplaces. Some health hazards caused to human operators in the workplaces are toxic fumes, heat, radiation, noise, physical injury, and so on. Therefore, the introduction of robots was required in several industrial applications like spot welding, arc welding, spray coating, die casting, and more.
This paper deals with the concept of robotics like kinematics, dynamics, sensing and control of robots, and robotic programming. This gives an understanding on mechanics of industrial manipulators and offers a treatment of position analysis, dynamic analysis, static analysis, trajectory planning & control and programming concepts of manipulator along with industrial and non-industrial applications.

IMRP: Manufacturing and engineering depend heavily on computers for many low-level operations, including design, resource planning and production scheduling. But only a few companies have implemented the sort of enterprise-wide computerized planning/project management found in other industries. However, substantial gains in productivity, flexibility, and production costs are to be made from

integrating all aspects of the planning and scheduling process. Examines the need for integrated, company-wide planning in manufacturing/engineering companies, and highlights how it is increasingly being applied to the different parts of the production cycle. Its also deals with advance manufacturing techniques like flexible manufacturing system (FMS), computer integrated manufacturing (CIM), and also with material handling system like robots & AGVs.

Quality: To know more about the quality tools and functions which are used in any of the industry to inspect a lot and scrutinize them on the basis of their quality characteristics. Beside this we came to know about various problems solving technique like Pareto analysis, Ishikawa diagram, Interrelationship diagram, etc.

Computer Aided Manufacturing (CAM): This subject basically deals with various programming languages and computer applications in manufacturing or production engineering (CNC, DNC, etc.) for minimizing the production time and cost of the product. Also deals with modern manufacturing tools like Additive Manufacturing, Green Manufacturing, and the application of computer in Inspections.

Production Planning and Control (PPC): Production planning and control system in an industry invariably solves the following purposes:

1. Minimizes the mismatch between demand and supply.
2. Maximize the capacity and utilization of facilities.
3. Minimizes the work in process inventory (WIP).
4. Maximizes productivity and flexibility of product range.

Ecology: This subject deals with the effect of industrialization on our environment, surroundings, and also affecting the flora and fauna around our ecosystem. Also deals about the various conventional and non-conventional sources of energy.

Industrial Pollution Control (IPC): This subject deals with the following course objectives:

1. Identify sources, types, and control equipment for different types of industrial pollution.
2. Identify sources of water pollution, general water treatment, and waste water treatment.
3. Understand reasons of land degradation and soil quality loss.
4. Classify various health problems emerging off industrial activities.
5. To develop an understanding on occupational health and safety measures.

Computer Aided Design Lab: The CAD Laboratory has around 30 computers (desktops and workstations) with the latest configurations connected with a high-end server through switched networking. This Lab gives students an exposure to 2D & 3D Modelling concepts, Part Assemblies, Simulations using softwares like Auto CAD, CATIA & PRO-E.
Softwares like GPSS (General Purpose Simulation Software) are also used by the students to simulate the real time situations in facilities to optimize the resources available and to find their overall Utilization.

Computer Aided Manufacturing Lab: This laboratory has number of sophisticated equipments, which not only being utilized for the training of students but also utilized for the Research work of the department and giving support to the other research work going in the institute. These facilities are also being utilized for supporting the medium and small scale industries situated in and around Ranchi.
Major Equipments available are:

1. Flexible Manufacturing Systems & Robotics

FMS is an integrated, computer controlled, automated manufacturing system covering material handling system, CNC machine tools, inspection, storage and retrieval system that can simultaneously process medium-sized volumes of a variety of parts.
The FMS lab provides excellent facility, equipment, and information systems for hardware-based experiments, computer-based modeling, simulation and analysis and education.

2. **PLCs and Sensors**
PLC (Programmable Logic Controller) is a device used to control various Hydraulic and Pneumatic actuators used in various automated manufacturing systems such as Robots, CNCs, etc.
Various types of Tactile and Non Tactile Sensors are studied along with their applications in automated machines and robots.

3. **CNC Machines**

Various types of CNC machines like CNC Lathe, CNC Milling, and CNC Drilling are studied by students and different types of jobs are prepared to visualize their workings.

Department of Remote Sensing

Department of Remote Sensing was established in 1997 with an aim to meet the increasing demand for qualified manpower in this rapidly developing field. Application of Remote Sensing/Geoinformatics techniques using tools such as Geographic Information System (GIS) and Global Positioning System (GPS) in various activities including resources evaluation, environmental monitoring and land use/land cover mapping, urban planning, etc. has grown considerably during the last few decades. RS data products are increasingly being used for plan formulation at all levels. An essential pre-requisite to partaking in these opportunities is the building of various indigenous capacities for the development and utilization of space science and technology. This has led to a spurt in the demand for qualified manpower in this field.

Programmes Offered	Intake
M.Tech in Remote Sensing -2 years (4 semesters)	18
M.Sc. in Geoinformatics -2 years (4 semesters)	20
Ph.D. in all branches of Remote Sensing, GIS, Earth Sciences	

Vision of the Department:

Be a centre of excellence in the field of Remote Sensing and Geoinformatics Technology education and research to match the needs of ever increasing requirement of human resources in these fields and to cater to the larger interest of the Society and Nation.

Mission of the Department:

- Impart quality education and equip the students with strong foundation that could make them capable of handling challenges of the ever advancing technologies.
- Maintain state-of-the-art in research facilities and integrity with the world's leading universities and research organisations for constant improvement in the quality of education and research.

Department of Remote Sensing is a DST- FIST sponsored department and as also UGC-SAP supported. The department is associated with many National and International agencies for R&D projects and consultancy works. This department has been recognized and awarded several projects from Govt. of India and Govt. of Jharkhand.

Significance of Remote Sensing

The world is being scanned constantly by highly sophisticated Earth Resources Satellites like IRS, CARTOSAT (India), LANDSAT (USA), SPOT (France), ERS (ESA), RADARSAT (Canada), IKONOS and Quickbird etc. Availability of repetitive remote sensing (RS) data in digital and pictorial forms has increased the scope of identifying, mapping, monitoring, classifying and evaluating different forms of renewable and non-renewable earth resources using multi-spectral, multi scanner and multi-temporal RS data products. The benefits of space technology, both direct and indirect, have introduced new dimensions into the study and understanding of Earth's processes and in improving the quality of life for the people living on it.

Department is participating in EDUSAT Programme of Indian Institute of Remote Sensing (IIRS), Department of Space (DoS), Dehradun for imparting "Distance Learning Course on RS, GIS, and, GPS and DIP".

LABORATORIES IN THE DEPARTMENT

The department has set up several labs listed below for hands-on training to its postgraduate students such as for Digital Image Processing (DIP), GIS, GPS, Photogrammetry, Digital Photogrammetry, Cartography and Image Interpretation.

1. Geographic Information System (GIS) Lab
2. Digital Image Processing (DIP) Lab
3. Digital Photogrammetry Lab
4. Cartography & Image Interpretation Lab
5. GPS & Satellite Navigation Lab
6. Project Lab
7. Map Production & Reprographic Lab

These labs are equipped with latest new generation computer systems, workstations, server along with software for GIS, Cartography, and DIP such as ArcGis, ERDAS Imagine, ERDAS Virtual GIS, LEICA Photogrammetry Suite, ENVI, Definines, Insar Earth View, River Tool, PCI Geomatica, Image Analyst, Modular GIS Environment (MEG), IIRAS, Geomedia Professional, Geomedia Intersite Interplot Professional. The department labs are also equipped with instruments like DGPS, handheld GPS, large format scanner, flatbed scanner, map plotter, printer, Procom-2 Optical Pantograph, Mirror Stereoscopes, Ground Truth Radiometer (GTR) etc.

Programme Educational Objectives

- To prepare the students in identifying, analysing and solving geospatial problems.
- To train the students in developing practical and executable solutions to the challenges of growing field of Remote Sensing and GIS.
- To impart the students with strong base of knowledge that makes them suitable both for industries as well as for teaching and research.
- To inculcate the students with the sensitivity towards ethics, public policies and their responsibilities towards the Society.

Department of Space Engineering and Rocketry

The Department of Space Engineering and Rocketry – the first of its kind in the country was established in 1964 to train scientists and engineers in the important areas of Aerospace Engineering and Rocket Technologies. Since 1968 it has been offering a post- graduate degree course leading to M.E. in Space Engineering and Rocketry with in-depth specialization in two specific areas- namely Aerodynamics and Rocket Propulsion. The Department aims to provide state of art education and training to its students to enable them to contribute efficiently in the National efforts being made in the fields of Space & Defence related technologies and challenging future missions.

Programmes Offered	Intake
M.E. in Space Engineering & Rocketry - 2 years (4 Semesters) programme in two specializations	
a) Aerodynamics	12
b) Rocket Propulsion	12
Ph.D. Programme	

The Department also provides research facilities at doctoral and postdoctoral levels in the fields of Aerodynamics and Flow Studies, Propellant Technology, Rocket Propulsion, Combustion.

The Rocket Propulsion Laboratory has static test set-ups equipped with a computer controlled firing facility and PC based data acquisition and analysis system for solid, liquid and hybrid rocket motors. Basic infrastructure for design and fabrication of rocket motors is also available in the Department.

In the area of Propellant Technology, complete processing and characterization facilities are available for rocket propellants and igniters. Advanced techniques and equipments for carrying out research in the areas of high-energy material, igniters, inhibitors and insulators, and high performance metalized gelled propellants are also available in the Department.

Modern equipments like STA, TGA, DSC, Viscometers, Rheometers, Calorimeters Spectrophotometers Flame Propagation and Stability Unit etc. are available for training and research.

In the Aerodynamics Laboratory, 4 wind tunnels are available to train students and carry out research work in the fields of High speed / Low speed Aerodynamics, and unsteady Aerodynamics. Different types of pressure sensors and flow visualization techniques are available to study the flow field on scaled models of aerospace vehicles. Commercial software ANSYS to carry out CFD related activities is available with highend research licenses. In-house CFD code developmental activities are also undertaken and is the current research interest of the group.