

> Fr. Agnel Ashram, Bandstand, Bandra (W), Mumbai - 400 050. Phone : (022) 6711 4000, 6711 4101, 6711 4104 Website : www.frcrce.ac.in • Email : crce@fragnel.edu.in



# **RESEARCH PROMOTION POLICY**

## Effective from 17th Oct 2022



DR. KETKI JOSHI In-charge Research and Development DR. SURENDRA RATHOD Principal

Moulding Engineers Who Can Build the Nation



#### SOCIETY OF ST. FRANCIS XAVIER, PILAR'S FR. CONCEICAO RODRIGUES COLLEGE OF ENGINEERING (Approved by AICTE & Affiliated to University of Mumbai) Fr. Aggel Ashram, Bandstand, Bandra (M), Mumbai - 400, 050

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# **Preamble:**

Fr. Conceicao Rodrigues College of Engineering encourages multidisciplinary quality research related to science, engineering and technology in the domain of Computer Engineering, AI and Data Science, Electronics engineering, Mechanical engineering, Sciences and Humanity. Academic research, funded research projects, and the creation of intellectual property in the engineering and technology domains are all part of the research activities. The institute strives to create a vibrant research environment for faculty and students engaged in emerging areas. A research and development committee is formed to support the research ecosystem and channel the related activities.

## Vision:

To foster an environment conducive to multi-disciplinary research in engineering and technology.

## Mission:

- 1. To promote inventiveness and moral research among faculty, students, and alumni.
- 2. To encourage interdisciplinary and collaborative research that benefits various facets of society and industry.

## **Objectives:**

- To inspire faculty and students to realize their research potential and improve their involvement in research and development activities.
- To support collaboration and interdisciplinary research projects.
- To support the students and faculty in their efforts to create, protect, and leverage Intellectual Property Rights.

In light of these goals, a research and development committee has been formed at Fr. CRCE to strengthen the institute's presence in the field of research by actively promoting research culture and facilitating research activities.

## **Short-Term Objectives:**

- Conducting faculty and student development programmes to improve understanding of research and IPR.
- Creating awareness and encouraging quality research publications in standard journals.
- Creating awareness and encouraging students and faculty to apply and publish patents and IPR.
- Facilitating applications for research grants to various funding agencies

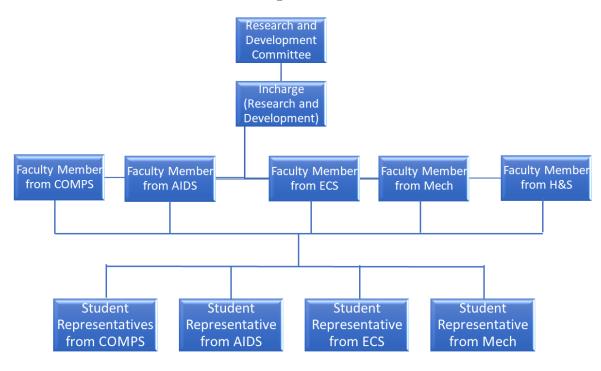


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#### **Long-Term Objectives:**

- Collaborating with national/international agencies on research projects and IPRs.
- Enhancing research contribution by the students and faculty in the institute and improve its research ranking.
- Channelizing efforts by researchers to receive grants, commercialization of Patents and IPRs and the technology transfer.
- Engaging the researchers in providing technology solutions to practical problems implementable in the industry and society.



## **Structure of Research and Development Committee**



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## **Roles and Responsibilities of the Committee:**

## Faculty Members in the Research Committee:

- 1. To work toward motivating Institute faculty and students to achieve R&D objectives, short-term and long-term research and development goals.
- 2. Encourage faculty to write effective research proposals and to provide the necessary assistance when applying to various funding agencies.
- 3. Encourage faculty and students to organise and attend conferences/STTP/workshops/Seminars/Training/FDP/SDP related to cutting-edge technology, research, and intellectual property.
- 4. Raise awareness of, and encourage, quality publications, research contributions, and IP generation among faculty and students.
- 5. To familiarise students with new technological innovations and research prospects.

#### **Student Representatives in the Research Committee:**

- 1. Assist faculty members in organising various events such as workshops, seminars, trainings, and certification courses to promote research and intellectual property rights.
- 2. Informing students about various R&D initiatives and research project opportunities, and encouraging them to participate in related activities.
- 3. Encouraging students to publish research papers or apply for patents related to minor or major projects completed during the academic course.



## **Department of Electronics and Computer Science**

## **Major Thrust Areas and Research Facilities**

#### Abstract:

The department was established in 1987 with B.E. in Electronics Engineering. From the academic year 2019-20, the course is renamed to Electronics and Computer Science to cope up with the 4<sup>th</sup> Industrial revolution. The perfect blend of knowledge of computer technologies with electronics provides the path to the new edge computing. In line with one of the missions of the department "To cultivate an ambience to encourage innovation, research and entrepreneurship skills", the R & D cell promotes research culture and research projects in the department by providing computing as well as hardware facilities. The main focus is to develop multi-disciplinary projects that address the societal problems in real-life. One of the possibilities could be by integrating AI/ML solutions in Internet of Things (IoT) in areas like Smart farming, Healthcare, Smart Cities, etc. Novel research in solving security issues in IoT is also a desired outcome. The department also aims to produce quality research publications and competent multi-disciplinary projects by students and faculties. The department/institute also offers honours/minor Degree programs in Artificial Intelligence and machine learning, cyber security and, Block chain.

#### **Objectives:**

- 1. To investigate and analyse the issues related to power consumption, security, data privacy and data linking in real-world and provide solution using IoT and related technologies.
- 2. To design, analyse and develop automated system with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.
- 3. To develop system and applications programs by optimizing, analysing and investigating the theoretical analysis of the algorithms.

#### **Research Domains:**

The department has following research domains mainly.

- 1. Internet of Things
- 2. Automation
- 3. Computation and Algorithms
- 4. VLSI Design



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#### **Research Facilities:**

The facilities available with departments/Institute are as follows:

Thrust Areas	Description	Facilities/ resources
Internet of Things	Issues related to Power consumption, Security, Data privacy, Complexity of Data, Issues related to data linking and processing	Raspberry Pi4 Model B (4GB) Kit with Sensors, Node MCU ESP8266 Board, IOT based digital electronics workbench, IOT Sensor Interface, ESA 51 E, PIC 18Fxx Board with LED USB Interface
Automation	Nonlinear Systems, Multi-agent systems and their coordinated control, Intelligent Data Mining Algorithms and Applications, Health Monitoring and Intelligent Fault Diagnosis Systems, Soft- Computing in Modelling and Control, Brain Computer Machine Learning, Unmanned Aerial Vehicles	Instrumentation and Transducer trainer with on board Sensor and Actuators, 6 Axis Robotic, Arm with 250gm Payload Capacity, Industrial 4 port I/O link IFM Germany make with Temperature and speed I/O Sensors, PLC TRAINER-10 with Allen Bradly micrologix 1400(with software license), HUMAN MACHINE INTERFACE (HMI), WINLOG PRO,32TAG WEB ENABLED SCADA SOFTWARE
Computation & Algorithms	Data structures, Algorithms, Computer organization and architecture, Operating system, Object oriented programming, Image processing, Machine Learning, Deep Learning, Artificial Intelligence	Department has three computing laboratory with state-of-the-art software/tools like Jupyter, Tensorflow, JDK, PGAdmin, Hadoop. Specialized high end Machine learning server with 32GB GPU to cater to ML projects.
VLSI Design	Analog CMOS VLSI Design, Mixed Signal Design, FPGA based System Design	FPGA prototype boards, Simulation tools



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# **Department of Mechanical Engineering**

## **Major Thrust Areas and Research Facilities**

The department presently offers B.E. (Mechanical Engineering), M.E. (Mechanical Engineering) with specialization in CAD/CAM and Robotics and Doctoral Program in Mechanical Engineering. The department also offers honours programs in Robotics, 3D Printing, Data Science and IOT.

Having a legacy in production engineering since its establishment in 1984 and experience in offering Mechanical Engineering program at PG and PhD level, the department converted UG program in production engineering into mechanical engineering in 2019-20, in response to the changing industry requirements. With an experienced and qualified pool of faculty and state-of-art laboratories, the department has the following research domains and departmental/institute level facilities.

#### **Research Domains:**

The department has three research domains.

- 1. Manufacturing
- 2. Design
- 3. Automation

<b>Research Domains</b>	Thrust Areas	<b>Research Facilities</b>
Manufacturing	Design of CNC Systems	Production Grade CNC
	Smart materials	Machines
	Nano materials	MQL unit
	Composite materials	High resolution inverted
	Material characterization	microscope with material
	Microstructure analysis	analysis software
	Minimum quantity lubrication	Digital UTM
	machining	Fatigue Tester
	MQL Machining with nano-fluids	Metallurgical Furnace
	Sheet metal forming	3D Printer
	Plastic injection moulding	Arena Manufacturing
	Additive manufacturing	System Simulation software
	Computer Aided Manufacturing	
	Manufacturing System Simulations	
	Discrete Event Simulation	
	Manufacturing Process Simulations	
	Machine vision and applications	

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Design	Computer Aided Design	Modelling and Analysis
	Computer Aided Engineering	softwares: Autocad,
	Simulation based Design and	Solidoworks, Ansys, NX11
	Optimization using Finite Element	Machine Learning and data
	Analysis (FEA)	analytics softwares
	Simulation based Design and	
	Optimization using Computational	
	Fluid Dynamics (CFD)	
Automation	Mechatronics and IOT	Automation Softwares:
	Industrial Robotics	Fluidsim for Pneumatics
	Vision Systems	and Hydraulics
		PLC Systems
		Robotic Arm



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## **Department of Computer Engineering**

## **Major Thrust Areas and Research Facilities**

The Department of Computer Engineering was established in 1991. The department offers B.E. in Computer Engineering, a four-year degree program with an intake of 120 students. It has excellent infrastructure and highly qualified and professionally skilled faculty. The department conducts various training programs to help faculty and students to improve their technical knowledge. The Department has received a Research Grant from the Department of Science and Technology (DST), and Mumbai University for Innovative Projects and Minor Research Grant. It has signed MoU with several companies like Tata Consultancy Services, IBM and D-Link. Graduates of our department have been recruited by major IT companies such as TCS, Accenture, Morgan Stanley, JP Morgan Chase, ZS, Seclure, SAP, Amdocs to name a few.

#### Abstract:

The Department of Computer Engineering has a goal to increase the number of innovative and mostly multi-disciplinary research projects through the efforts of faculty members and students. This results in the nurturing of research activities, the procurement of equipment and the development of state-of-the-art research facilities. These projects address the requirements of real-life problems. More importantly, one of the major mandates of the Department of Computer Engineering is to participate in international conferences and reputed journals. The issue of concern to society is also addressed by the faculty members and students through sponsored projects. The deliverables of the R&D endeavour are innovative and affordable technology and products.

## **Thrust Areas and Subareas of Computer Engineering Department:**

Big Data, IoT, AI, and automation are the key components of Industry 5.0 in every industry. Therefore, it is crucial to investigate interdisciplinary fields for computer science and engineering applications. Cyber Physical Systems is one of these areas, where joint research projects are carried out with other departments.

Research domain	Description	Facility
Data Science, Artificial Intelligence and Computing	Machine Learning, Deep Learning, Natural Language Processing, Big Data Analytics, Data and Web Mining, Machine Vision, Cloud Computing	Advance Computing Lab supported with Deep Learning and Cloud server.

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Cyber Physical Systems	Blockchain Technology, Cryptography and Network Security, Cybernetics, Human- Computer Interaction, Robotics, Quantum Computing, Internet of Things	Network and Security Lab supported with D Link DCS wireless kit and switches.
Software and System Engineering	Algorithms, Computer Architecture, Operating system, Database Systems Software Engineering	Programming and Database Lab



## **Department of Artificial Intelligence and Data Science Engineering**

## **Major Thrust Areas and Research Facilities**

Globalization, fast-paced growth of data and technological advancement has created a lot of exciting career opportunities. Data Science and Artificial Intelligence are the two most important technologies in the world today. While Data Science makes use of Artificial Intelligence in its operations, modelled after the natural intelligence possessed by humans, Artificial Intelligence is the algorithmic intelligence that is possessed by the machines to perform various autonomous actions. Data Science is a multi-disciplinary field that has conquered industries around the world. It has brought about a fourth industrial revolution in the world today. This is a result of the contribution by the massive explosion in data and the growing need of the industries to rely on data to create better products. We have become a part of a data-driven society. Data has become a dire need for industries that need data to make informed decisions. Fr. CRCE offers a new-age BE program in Artificial Intelligence and Data Science with the main objective of setting up students' careers in the most high-demand industry of the twenty-first century. Department has an experienced pool of faculty and UpToDate computing lab facilities to excel in this domain. Yet, our relatively small size makes for a collaborative and cooperative environment within which a broad set of research groups flourish.

Research domain	Description	Facility
Data Science, Artificial	Machine Learning,	Advance Computing
Intelligence and Computing	Neural networks and Deep	Lab supported with
	Learning	Deep Learning and
	Data Mining	Cloud server and
	Natural Language Processing,	Workstations with
	Big Data Analytics, Data and	configuration such as
	Web Mining,	Intel core i7-
	Machine Vision, Cloud	11700, 16Mb
	Computing	cache, 8 core,
	Pattern Recognition	16GB, DDR4,
	Data warehousing	1TB HDD, Nvidia
		T1000

#### Thrust Areas and Subareas of AI&DS Department:



## **Department of Humanities and Science**

## **Major Thrust Areas and Research Facilities**

Humanities and Science department established in 1984. With an experienced and qualified pool of faculty and state-of-art laboratories, the department has the following research domains and departmental/institute level facilities.

The department has four research domains-

- 1. Physics
- 2. Chemistry
- 3. Mathematics
- 4. Communication Skills

<b>Research Domains</b>	Thrust Areas	
Physics	Material Science	
	Conducting Polymer and their Nanocomposites	
	Material characterization	
Chemistry	Plant Extraction	
	Medicinal Chemistry	
	Material Chemistry	
	Nanochemistry	
	Environmental Chemistry	
Mathematics	Mathematical Finance	
	Game Theory	
	Environmental Science	
Communication Skills	English Literature	
	Communication Skills	

#### **Research Facilities:**

Department has sufficient facilities to conduct experimental as well as theoretical research in mathematics, sciences and humanities. Various test and measuring instruments are available in the department.



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## **Institute Initiatives to Promote Research and Development**

#### International Conference on Advances in Computing, Communication and Control

A biennial multidisciplinary International Conference on Advances in Computing, Communication and Control (ICAC3) is organised by Fr. Conceicao Rodrigues College of Engineering. The primary goal of this conference is to promote research and development activities in Computing, Communication and Control in India and the rest of the world. The Conference also aims to offer a collaborative platform for the people in Academics, Research and Industry to address emerging issues and solutions in the above-mentioned areas. The previous seven editions of the Conference were organized in January 2009 (In cooperation with ACM), January 2011 (Springer), January 2013 (Springer), April 2015 (Procedia Computer Science), December 2017 (IEEE), December 2019 (IEEE) and December 2021(IEEE Xplore) respectively. The best paper award is also given to the authors whose work represents breakthrough research in the respective field.

#### Anti-plagiarism software

Turnitin Anti-plagiarism software is purchased by the institute to facilitate the submission of quality research papers. It is essential that the software is extensively used by the faculty to check originality of Research Papers, Doctoral Thesis, PG and UG reports by the students.

#### Sponsored Research Projects:

Fr. CRCE encourages faculty to submit a research project for extramural funding to various institutions such as the All India Council for Technical Education (AICTE), Department of Science and Technology (DST), University Grant Commission (UGC), University of Mumbai etc. The Research and Development Committee will provide assistance and support in the submission of sponsored research projects to various funding agencies. The committee will facilitate proposal review by involving senior researchers from the institute related to the respective domain to evaluate and comment on necessary improvements related to the idea, methodology, feasibility, novelty, and contribution.

Even though all teachers are encouraged to apply for various research grants, it is mandatory for Professors and Associate Professors to apply for Major Research Grants in every academic year. Annual performance of Professors and Associate Professors will be judged based on the research grants applied and amount of research grant fetched.

#### Workshops/Seminars/FDPs/STTPs/SDPs:

Fr. CRCE has organised and shall continue to organise a variety of workshops, seminars, FDPs, STTPs, SDPs, and trainings on cutting-edge technologies, research, and intellectual property. The committee on research and development will encourage faculty and students to organise and participate in such activities. The committee will plan and carry out various Research and IPR-related activities to facilitate idea exchange and promote research culture, with the goal of improving individuals' and the institute's research profile.



## Research Collaboration and Memorandum of Understanding (MoU):

The Research and Development Committee, in collaboration with the research guides of the research centre and experienced faculty members from various domains, will facilitate the signing of Memorandums of Understanding (MOU) related to research activities with various organisations. Annual performance of faculty shall be judged on successful research collaboration with industries and research

The institute has MoUs with various organizations/universities/institutes Tata Consultancy Services, IBM, D-Link, University of Texas at EL Paso. Synergy Consultancy, Christiani Sharpline to name a few.

#### **Research Scholars Colloquium:**

Research colloquium is the proposed activity which can be conducted during the international conference ICAC3 being organised by the institute biennially. The research scholars and faculty working on sponsored project will be presenting their ongoing research project or sponsored project. The activity will be open to all the faculty, students and research scholars with the objective of facilitating interaction and sharing the latest results and findings with the faculty and students interested in the related field. The award may be given to the best presentation to encourage quality research and development.

#### Paper publications / Patent Applications related to B.E./M.E./PhD Project Work

B.E./M.E. students are required to publish a paper or apply for patent / copyright based on the outcomes of the major project. It is essential that the students follow industry standards specific to their domain and use open-source software Latex while writing project reports. For PhD all the norms related to publications given by University of Mumbai should be followed.

#### Paper publications / Patent Publications by Faculty

1. Faculty publications and patents are integral part of ranking and accreditation of programs and institutes. Good quality publications indicate research culture of the institution and can bring laurels to the institute and faculty involved. Hence faculty are required to publish paper or file a patent every year. It is mandatory for every faculty to publish at least one journal paper in an academic year.

2. Quality of publication has always been a matter of concern and hence it is necessary to set minimum acceptable standards. At Fr. CRCE, publication by faculty would be claimed if it is published in **SCI**, **Scopus or Web of Science index journal**.

3. It is mandatory for everyone to write '**Fr. Conceicao Rodrigues College of Engineering**' as an affiliation in the papers. Affiliation should be mentioned in full and not the acronyms like CRCE.

4. All faculty members should create and use **ORCHID ID** and should be linked to the Scopus.



## Incentives / awards for research achievements:

**Financial support to Undergraduate students for paper presentation at national / international conference:** Undergraduate students are eligible to get financial assistance in the form of partial reimbursement of the conference registration fee on successful presentation of the paper at national / international conference with necessary prior approvals. Research and Development committee can scrutinise the applications and institute financial supports will be based on quality of paper, quality of journal/conference and impact of research.

**Best Ph.D. Thesis:** Ph.D. thesis of all the research scholars completing Ph.D. from the college research centre during the academic year will be evaluated by an expert panel. Best Ph.D. Thesis will be awarded to the researcher having most significant research contribution among the candidates. The evaluation will be based on the criteria related to publications in national and international journals, conferences and transactions, book chapters, awards and recognitions, collaborative research, funding and IPRs. Rubrics for evaluation of best thesis shall be developed.

**Research Grant:** A faculty member working on a research project funded by external agency will be provided necessary support from the institute for its completion and will be permitted to use the infrastructure and research equipment available in the institute, with prior approval through proper channel. Institute may issue 'Letter of Appreciation' to a faculty member who successfully complete the funded research project.

## **Annual Reports:**

The research and development committee will prepare the following annual reports at the end of academic year:

- R&D activities conducted during the year
- Faculty and student contribution to research
- List of publications by faculty and students