RESEARCH INTERNSHIP PROGRAM

Preamble:

An internship serves as a pivotal experience, marking the transition from being classroom learners to becoming competent professionals in their respective industries. Recognizing the need to bridge the gap between academic learning and research organizations, our institution has developed a comprehensive approach to groom students effectively. This initiative stemmed from insightful discussions with our ecosystem partners who are connected with institute and our incubation centre, as well as feedback from successful alumni in diverse sectors.

The decision to introduce a 6-month internship program was prompted by our institution achieving 'Autonomous' status in 2017. This program is strategically integrated into the 6th semester of the undergraduate curriculum and the 4th semester of the postgraduate MCA program. Credits are duly assigned to recognize the significance of this practical experience.

During their internship tenure, students undergo rigorous evaluation supervised by industry mentors and specially constituted committees. This evaluation not only assesses their performance but also ensures alignment with industry standards. The guidelines outlined in this document provide a structured framework for evaluating and enhancing the internship experience, thus preparing our students comprehensively for their future professional endeavours. The Research Internship Program offers a valuable opportunity for emerging researchers to enhance their skills, gain practical experience, and contribute to impactful research. By fostering a collaborative learning environment, the program not only prepares participants for future academic and professional endeavours but also promotes innovation and discovery within the research community.

Research Internship Program

Research internship aims at providing hands-on training to work on research problems, techniques, methodologies and various other aspects in pursuing quality research.
Research Internship Program is a 15 credit program offered in third year semester VI across all the departments. The program starts in January and ends in June every year.

Objectives of Research Internship program

Research internship objectives are providing practical research experience, enhancing skills, and contributing to academic or industry knowledge.

Here are some common objectives for research internships:

1. Develop Research Skills:
- Gain hands-on experience with research methodologies, tools, and techniques.
- Learn to design experiments, conduct surveys, and collect and analyze data.

2. Enhance Analytical and Critical Thinking:
- Improve the ability to critically evaluate literature, theories, and research findings.
- Develop problem-solving skills by addressing research questions and hypotheses.

3. Contribute to Ongoing Research Projects:
- Assist in advancing the goals of ongoing research projects within the host organization.
- Provide meaningful contributions that may lead to publications or further research.

4. Learn and Apply Research Ethics:
- Understand the ethical considerations in conducting research, including data privacy and integrity.
- Apply ethical principles in the handling and reporting of research data.

5. Explore Career Paths in Research:
- Gain exposure to academic, industrial, or governmental research environments.
- Evaluate interest in pursuing a career in research, academia, or related fields.

6. Develop Technical Proficiency:
- Master specific software, tools, or equipment required for the research area (e.g., statistical software, lab equipment).

7. Produce a Research Output:
- Complete a research project or component of a project, with a tangible outcome such as a paper or patent.

8. Build a Professional Network:
- Establish connections with mentors, researchers, and peers in the field.
- Engage in discussions and collaborations that could lead to future research opportunities.

These objectives help the interns to gain valuable skills and contribute meaningfully to their research area.

Enrolment Process for Research Internship

Following process to be adopted for students desiring to opt for research internship.

1. Application Preparation by Students

- Identify Research Interests:
  - Students should identify their research interests, strengths, and the areas they wish to explore.
- Prepare Application Documents:
  - Intent Letter/Statement of Purpose: A letter explaining why the student wants to pursue a research internship and their areas of interest.
  - Curriculum Vitae (CV)/Resume: Highlight academic achievements, relevant coursework, research experience, and technical skills.
- Obtain Faculty Recommendations:
  - Secure one or more recommendation letters from faculty members who can vouch for the student's research aptitude and academic abilities.

2. Submission to Internship Coordinator

- Collect and Review Applications:
  - The Internship Coordinator collects applications from all interested students.
  - They review each application to ensure all required documents are complete and the student's research interests are clearly articulated.

3. Shortlisting and Matching

- Match Student Interests with Research Institutes:
  - The Coordinator matches each student's research interests with the ongoing research projects and expertise available at premier research institutes in India.
- Shortlisting Professors:
  - A list of potential professors, labs, or research groups that align with the student's research interests is prepared.
- Forwarding Applications:
  - The Coordinator forwards the student applications to selected professors or research groups.

4. Communication with Professors

- Professors Review Applications:
  - Professors at the research institutes review the applications they receive.
  - They may contact co-ordinator or students directly for further clarification, interviews, or discussions regarding potential research topics.
- Offer of Internship**:**
  - Professors extend internship offers to selected students based on their suitability for the research projects.

5. Acceptance and Confirmation

- Student Acceptance:
  - Students who receive offers review the terms of the internship, such as duration, research project details, and expected deliverables.
  - They formally accept the internship offer and communicate their decision to both the professor and the Internship Coordinator.
- Confirmation from Coordinator:
  - The Coordinator records the acceptance and ensures all necessary paperwork and approvals are completed.

6. Pre-Internship Orientation

- Orientation Session:
  - The Internship Coordinator conducts an orientation for selected students, covering the expectations, code of conduct, and logistics of the internship.
- Mentorship Assignment:
  - Each student is assigned a faculty mentor within the institute, who will be their primary point of contact during the internship.

7. Conducting the Research Internship

- Project Work:
  - Students work on their assigned research projects, with regular guidance from their research mentor and SPIT faculty mentor.
- Progress Monitoring:
  - Periodic reviews are conducted to track progress and provide feedback by the SPIT faculty mentor.

8. Final Report and Presentation

- Report Submission:
  - Students compile their research findings and submit a detailed report to their mentor and the SPIT Faculty mentor.
- Presentation:
  - A final presentation of the research work is conducted, where students present their findings to a panel, including their mentor and faculty members from their home institution.

9. Certification and Evaluation

- Performance Evaluation:
  - The student's performance during the internship is evaluated based on their research output, engagement, and adherence to research protocols.
- Issuance of Certificates:
  - Upon successful completion, students receive a certificate of internship completion, which may include remarks or recommendations from their mentors.

Evaluation of Research Interns

The evaluation process for an internship typically includes several key components:

1. **Commitment and perseverance:** A formal assessment of commitment involves the strong sense of responsibility while perseverance emphasizes the ability to persist challenges and setbacks.
2. **Analysis, Design and implementation skills:** Evaluating the core skills necessary to solve the given task/problem.
3. **Supervisor Feedback**: A formal evaluation from the intern's supervisor provides insights into performance, strengths, and areas needing development.
4. **Final Presentation**: This program requires interns to present their work, showcasing what they've learned and achieved.

These elements together provide a comprehensive evaluation of the intern's performance and experience.

The most significant part of the internship is its evaluation which has the following process:

- A committee is constituted including 2 members from SPIT with the following eligibility structure:

  Chairman : A person holding experience more than 5 years in SPIT

  Member : A person holding experience more than one year in SPIT
- A chairman of the Committee will receive a notification to monitor and evaluate the internship of the allocated students for a six months internship program.
- Evaluation is based on VISUAL presentation by Interns and subsequent question/answer session.
- The evaluation is carried out in two phases i.e. Phase 1 (ISE) and Phase 2 (ESE).
- The student performance will also be evaluated by respective mentor/supervisor which carries 25 percentage weightage.

Our Research Mentors

Our research mentors from various organizations are mentioned in Table-1.

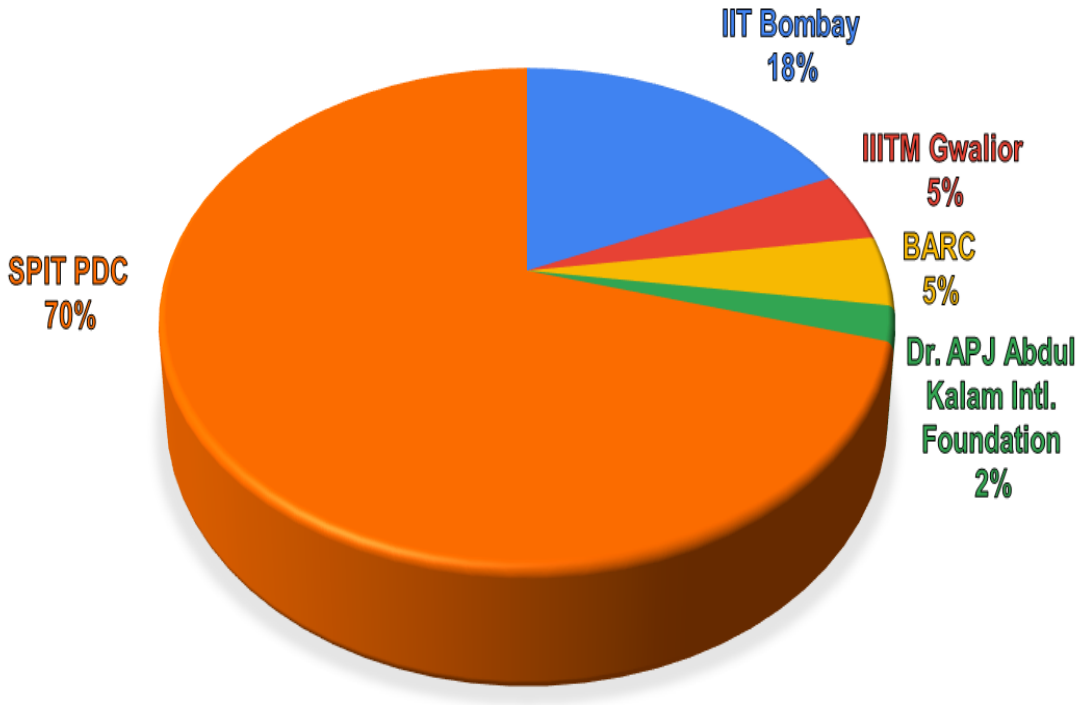
Table-1 : Research Mentors, affiliations and Domain expertise

Sr. No.	Research Mentor	Research Organization	Research Domain
1	Prof. Kshitij Jadhav	IIT Bombay	AI/ML in health
2	Prof. Balamurugan	IIT Bombay	Machine Learning, Data Mining
3	Prof. Vikram Gadre	IIT Bombay	Communication and Signal Processing, Wavelets and filter banks.
4	Prof. Gulab Singh	IIT Bombay	Radar remote sensing of stored water in snowpack and glaciers Radar polarimetry and polarimetric SAR data decomposition
5	Prof. Mandar Inamdar	IIT Bombay	Mechanics, Biophysics, Thermodynamics, Statistical Mechanics
6	Prof. Anil Kulkarni	IIT Bombay	Power System Dynamics and Control, Application of Power Electronics to Power Systems, Flexible AC Transmission Systems, HVDC Transmission Systems
7	Prof. Anirudha Joshi	IIT Bombay	Visual Design, Usability Studies, Human-Computer Interface Design
8	Prof. Sumit Saxena	IIT Bombay	Metamaterial design and fabrication Novel materials for Energy storage
9	Prof. Anil Kottantharayil	IIT Bombay	MOS device physics, design and modelling Materials for advanced CMOS devices
10	Prof. Shalabh Gupta	IIT Bombay	High Speed Serial Links and Interconnects Optical Fiber Communication, Silicon Photonics and Data Centre Interconnects
11	Prof. Rajkumar Pant	IIT Bombay	Design and Development of Lighter-Than-Air systems
12	Prof. Sandeep Anand	IIT Bombay	Electric Vehicles Drive Train and Chargers, Wide Bandgap Devices (GaN and SiC) based Power Converters,
13	Prof. Biswabandan Panda	IIT Bombay	Computer architecture and its interactions with compiler/OS/network for performance and security.
14	Prof. Maheshkumar Kolekar	IIT Patna	Digital signal, image and video processing, biomedical signal processing, deep learning, machine learning, neuro-cognition.
15	Prof. Sheila Roy	SPJIMR Mumbai	Operations Supply Chain Management and Quantitative Methods
16	Prof. Harit Joshi	SPJIMR Mumbai	Operations Supply Chain Management and Quantitative Methods
17	Prof. Kapil Kant	ABV-IIITM Gwalior	Numerical Functional Analysis, Approximation Theory

Statistic of Research Internship (Batch 2022-23 Pass Out)

Forty four students in the year 2021-22 opted for research internships in various domains. They were connected with professors at research institutes and organizations accordingly. Eight students completed research internships at IIT Bombay, two at IIITM Gwalior, two at BARC, one at Dr. APJ Kalam Foundation, and thirty one at SPIT PDC.

The following pie chart illustrates the distribution.



Outcome and Impact of Research Internship

A. Research Paper/Book Chapter Publication

1. Arnav Ekapure and Dr. Aarti Karande wrote Book Chapter “Generic recommendation system based on web usage mining concept” in Book “Recent Advances in Material, Manufacturing, and Machine Learning” published by Taylor and Francis group in 2023. eBook ISBN Number : 9781003358596

2. J. J. C. Attukadavil, A. Nadkarni and B. G. Fernandes, "A 300 VA Low-Cost Efficient Standalone Photovoltaic System for Rural Applications," 2024 IEEE International Communications Energy Conference (INTELEC), Bengaluru, India, 2024, pp. 1-6, doi: 10.1109/INTELEC60315.2024.10678987.

B. **Opted for Higher Study**

Over 44 students opted for higher studies at various universities. The list of universities they enrolled in for graduate programs is given in Table-2.

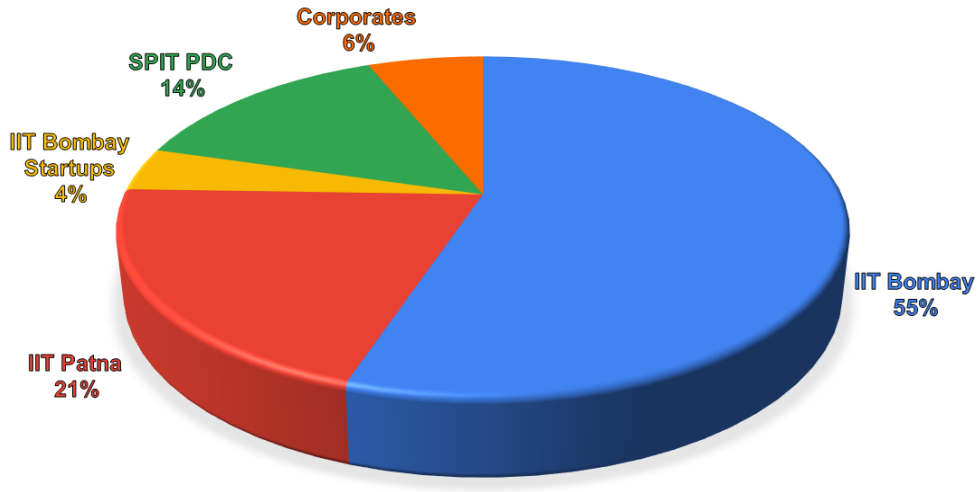
Table-2 : List of Universities where SPIT batch 2022-23 students enrolled for Graduate program

University	**University**
University of California, San Diego	University of California, Los Angeles
University of California, Davis	UMass Amherst
NC State University	University of Wisconsin - Madison
University of California	Penn State University
NC State University	Rutgers University
New York University	University of Minnesota
Tandon School of Engineering	Tata Institute of Fundamental Research
University of Massachusetts Amherst	Rutgers Business School
University of Illinois	Luddy School of Informatics, Computing and Engineering
Northeastern University, College of Engineering	University of Michigan
University of Southern California	Deakin University
Stony Brook University	University of Colorado Boulder
	University of Texas Dallas

Statistic of Research Internship (Batch 2023-24 Pass Out)

Forty Nine students in the year 2022-23 opted for research internships in various domains. They were connected with professors at research institutes and organizations accordingly. Twenty-seven students completed research internships at IIT Bombay, ten at IIT Patna, two at SINE IIT Bombay startups, seven at SPIT Research Centre, and three at corporate organizations.

The following pie chart illustrates the distribution.



Outcome and Impact of Research Internship

C. Research paper Publications

[1] S. Bose, S. Nawale, D. Khut and M. H. Kolekar, "LumiNet: Multispatial Attention Generative Adversarial Network for Backlit Image Enhancement," in IEEE Transactions on Instrumentation and Measurement, vol. 72, pp. 1-14, 2023, Art no. 5027314, doi: 10.1109/TIM.2023.3317384.

[2] S. Bose, M. H. Kolekar, S. Nawale and D. Khut, "LoLTV: A Low Light Two-Wheeler Violation Dataset With Anomaly Detection Technique," in IEEE Access, vol. 11, pp. 124951-124961, 2023, doi: 10.1109/ACCESS.2023.3329737.

[3] Guruprasad Parasnis, Rajas Bhope, Anmol Chokshi, Vansh Jain, Archishman Biswas, Deekshant Kumar, Saket Pateriya, Vijay Anand, Vivek Kanhangad and Vikram Gadre, “VerifNet - A Novel Score Fusion-Based Method Leveraging Wavelets with Deep Learning and Minutiae Matching for Contactless Fingerprint Recognition”, Authorea Preprints,October 31, 2023.

D.Opted for Higher Study

Over 40 students opted for higher studies at various universities. The list of universities they enrolled in for graduate programs is given in Table-3.

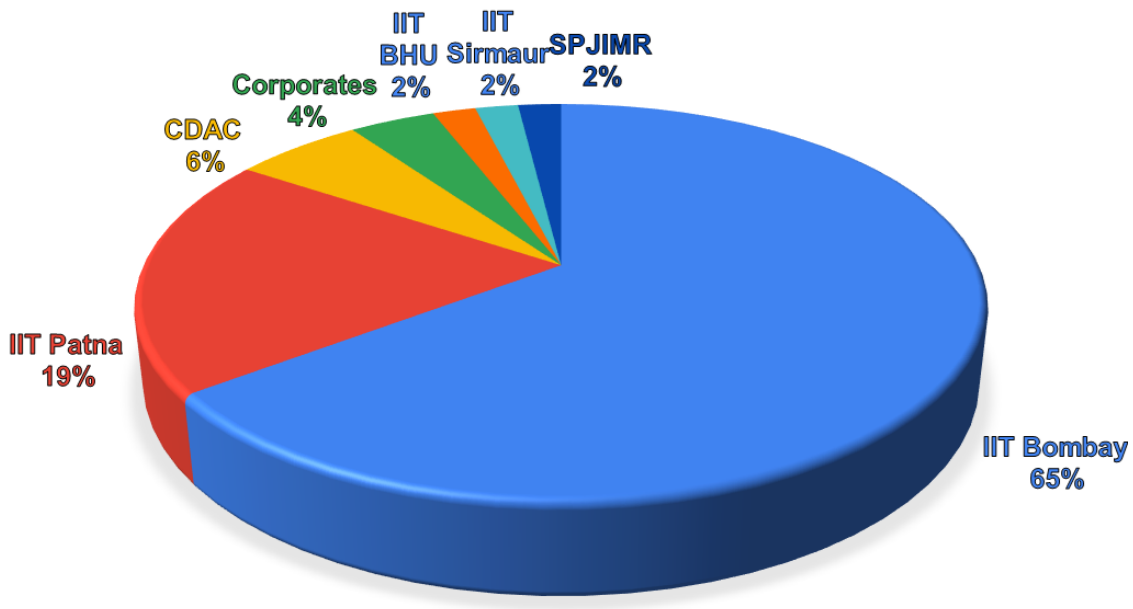
Table-3 : List of Universities where SPIT batch 2023-24 students enrolled for Graduate program.

University	University
Carnegie Mellon University	Johns Hopkins University
Indiana University Bloomington	George Mason University
Stony Brook University	University of Wisconsin Madison
Rutgers University	Northeastern University
ETH Zurich	Duke University
University of Massachusetts Amherst	University of Pennsylvania
University of Southern California	University of Southern California
Dartmouth College	Technical University of Denmark
Stony Brook University	Stony Brook University
Indian Institute of Management, Kozhikode	University of Leeds
Delft University of Technology	New York University (NYU)
San Jose State University	Virginia Tech
University of California San Diego	North Carolina State University
	University of Texas at Dallas

Statistic of Research Internship (Batch 2024-25 Pass Out)

Fifty-one students in the year 2023-24 opted for research internships in various domains and were accordingly connected with professors at research institutes and organizations. Thirty-three students completed research internships at IIT Bombay, ten at IIT Patna, one at IIT BHU, one at IIM Sirmaur, three at CDAC Mumbai, one at SPJIMR Mumbai and two at corporate organizations.

The following pie chart illustrates the distribution.



Outcome and Impact of Research Internship

A. Research paper Publications

[1] Agnesh Chandra Yadav, Maheshkumar H. Kolekar, Yash Sonawane, Gargi Kadam, Sanika Tiwarekar, and Dhananjay R. Kalbande, ”EffUNet++: A Novel Architecture for Brain Tumor Segmentation Using FLAIR MRI Images” IEEE Access.

[2] Yash Sonawane, Maheshkumar H. Kolekar, Agnesh Chandra Yadav, Gargi Kadam, Sanika Tiwarekar, and Dhananjay R. Kalbande , “CRUNet++: A Depthwise Convolutional Residual UNet++ Model for Brain Tumor Segmentation”, ICPR 2024, Calcutta, India.

Executive Summary of Research Internship Program

Most of our bright students prefer corporate placements, as the offers are very attractive. However, many of them later shift to business education, and after five to six years, hardly any remain in the core domain. Almost no student shows interest in pursuing higher education at the century's elite institutes. Recognizing this pressing issue, the institute has conceived, deliberated, and articulated a unique, first-of-its-kind scheme. The Research Internship Program was introduced in the curriculum in the sixth semester in 2022 to promote research at the undergraduate level. To date, three editions of the program have been completed, benefiting 144 students through guidance from research experts. The program has led to notable research outcomes, including 4 journal publications, 2 conference publications, and 1 book chapter publication. Table-4 shows List of Research Organizations where SPIT students completed Research Internship Program till date. Out of 93 participating students of 2022and 2023 pass out batch, 84 have opted for higher education at overseas universities. These outcomes demonstrate the success of the Research Internship Program in fostering a strong research culture and preparing students for advanced academic pursuits. The program not only equips undergraduates with valuable research skills but also opens pathways to global educational opportunities, contributing to their holistic development and career readiness. As we continue to build on this foundation, we anticipate even greater achievements and a growing impact on our students' futures.

Table-4 : List of Research Organizations where SPIT students completed Research Internship Program

Organization	Total Interns	Organization	Total Interns
IIT Bombay	68	IIT Patna	20
IIITM Gwalior	2	IIT BHU	1
BARC	2	IIM Sirmaur (HP)	1
Dr. APJ Abdul Kalam Intl. Foundation	1	SPJIMR	1
SPIT PDC	38	Corporates	4