MALLA REDDY
VISHWAVIDYAPEETH
(Deemed to be University)

SCHOOL OF DIGITAL HEALTH SCIENCES & TECHNOLOGY

Fellowship in Medical Devices & Wearables

Created in 2025

Academic regulations for fellowship programmes

1. **DEFINITION**

   Fellowship: A fellowship is an advanced, structured programme focused on developing specialized competencies after the completion of a qualifying degree or equivalent experience. It offers structured learning and practical experience in a focused area. The purpose of the fellowship is to develop advanced knowledge, strengthen specialized skills, and prepare participants for professional growth within their chosen field.

2. **AIMS AND OBJECTIVES**

   The aim of the program is to provide program nurtures graduate and postgraduate candidates, building their expertise and skills to drive career excellence and impact in their chosen field.

   Full-Time Candidate: A full-time candidate is an individual who is enrolled exclusively in the fellowship program and is not engaged in any other professional, academic or employment obligations during the training period. These candidates are required to dedicate their time and effort to the structured fellowship programme, meeting the assigned outcomes through full-time participation that ensures immersive training and continuous engagement in all programme activities, including assigned duties, learning sessions, and assessments. Stipends for full-time fellowship candidates will be awarded as per MRV policy.

   Internal Candidate: An internal candidate is an individual currently employed by MRV or its affiliated institutes who wish to enhance their skills through the fellowship during their tenure at the institution. This includes faculty, residents, or staff. Internal candidates are not eligible for a stipend. Applications are subject to institutional approval.

   External Candidate: An external candidate is someone not employed by MRV or its affiliated hospitals and institutes at the time of applying for the fellowship. They may come from other academic institutions, healthcare organizations, or private practice. External candidates are required to complete all fellowship requirements as per MRV guidelines. No stipend will be provided.

   Sponsored Candidate: A sponsored candidate is nominated and financially supported by a recognized institution, organization, or employer such as a government body, healthcare institution, academic organization, or industry partner to pursue a fellowship at MRV. The sponsor typically covers fees or other program-related costs and may require the candidate to fulfill certain obligations, if any, upon completion as required by the sponsor. Employees sponsored by organizations must provide a formal no-objection certificate. Sponsored candidates are not eligible for a stipend.

3. PREREQUISITES

Criteria	Details
Eligibility	To be eligible for admission into the fellowship program at MRV, candidates must meet the following criteria: • Hold a recognized graduate or postgraduate degree with a completion certificate. • The fellowship must align with the candidate's prior qualifications and may require professional registrations. • Detailed eligibility criteria for ach fellowship, including approved qualifications are available on the MRV website.
Duration	• Undergraduate Degrees – Any recognized undergraduate degree – 12 months • Postgraduate Degrees – Any recognized undergraduate degree – 6 months • Super specialty Degrees – Any recognized speciality or advanced degree – 3 months * Duration for any category may be adjusted based on program requirements, as recommended by the Selection Committee.
Mode of Study	Theoretical, Lab-based Development, Simulation Workshops, Clinical Scenario Building, Capstone Project, Practical, Skill, Case-based

4. SELECTION AND COMMENCEMENT OF FELLOWSHIP

Fellowship Committee: The Fellowship Committee is established to uphold principles of transparency, fairness, and meritocracy in the selection process for the MRV Fellowship Program.

Composition of Fellowship Selection Committee

Sr. No.	Role/Position	Description / Designation
1	Chairperson	The Dean of the respective colleges and Schools of Eminence at MRV
2	Subject Expert	A Professor or Associate Professor from the concerned colleges and Schools of Eminence, MRV
3	Guide / Co-Guide	A Professor, Associate Professor, or Assistant Professor from the concerned colleges and Schools of Eminence, MRV
4	Convener	The Fellowship Coordinator of MRV
5	Ex officio Members	The Registrar and the Controller of Examinations,

		MRV

Duties of the Fellowship Selection Committee

- Ensure that the MRV fellowship program commences twice a year in accordance with the academic calendar issued by the university.
- Oversee the preparation and communication of the program schedule, including application deadlines, interview dates, and the start of training through the MRV website and relevant academic departments.
- Thoroughly evaluate all applications to ensure candidates meet the minimum requirements for completion.
- Assess academic credentials, prior qualifications, and overall suitability for the fellowship program.
- Conduct interviews for shortlisted candidates to evaluate knowledge, skills, and overall preparedness.
- Recommend a final list of eligible candidates for approval by the Vice-Chancellor based on the evaluation and interview outcomes.
- Oversee all aspects of the fellowship program from scheduling, implementation, to completion.

5. FEE STRUCTURE

Program Fees: The basic fee structures for each fellowship program are available on the respective program on the MRV website.

6. PROCEDURE FOR SELECTION AND ADMISSION

- **Eligibility Check:** Verify that applicants meet the basic eligibility criteria, including academic qualifications, professional experience, and relevant skills.
- **Document Review:** The Selection Committee reviews all applications for completeness and ensures they satisfy the program's eligibility requirements.
- **Personal or Virtual Interviews:** Shortlisted candidates may be invited for interviews, either in person or virtually. This allows the Committee to assess communication skills, motivation, and overall suitability for the fellowship.
- **Merit-Based Selection:** The Committee selects the most qualified candidates based on a combination of academic performance, professional experience, interview performance, and alignment of the applicant's goals with the objectives of the fellowship.

7. ALLOTMENT OF FELLOWSHIP GUIDE

Assignment of Guides: The allotment of fellowship Guides shall be undertaken by the Selection Committee, ensuring that only eligible and approved faculty members are assigned as Guides or mentors.

Criteria for Allotment are based on:

- Alignment of the fellow's area of interest with the Guide's specialization
- Availability and consent of the Guide
- Existing rotation or merit-based preferences as determined by the Committee

Role and Responsibilities of the Guide:

- Mentoring the fellow to acquire required skills and academic knowledge
- Providing guidance and support to ensure progress throughout the fellowship

- Conducting regular evaluations and offering academic and professional advice and submit periodic report to the Fellowship coordinator
- Supporting the fellow in meeting program requirements and objectives

External Collaborators: External collaborators from recognized institution may serve as fellowship co-Guides in conjunction with a Guide from MRV.

Change of Guide: Fellows may request a change of Guide, subject to approval by the Selection Committee.

8. FELLOWSHIP PROGRAM DESIGN

The fellowship program is designed to provide a structured and comprehensive learning experience that develops relevant skills, knowledge, and professional competencies. Upon completion, they should demonstrate proficiency in core skills, apply their knowledge effectively in professional settings, maintain professional standards, and document their progress.

Logbook Maintenance: Fellows must maintain a logbook throughout the program. The required entries may vary depending on the fellowship. The logbook will be reviewed and evaluated on a daily or weekly basis by the assigned Guide. Regular face-to-face feedback sessions with the Guide will be conducted to monitor progress and provide guidance.

Final Assessment and Exit Examination:

The final assessment by the assigned guides includes the following components:

1. Multiple Choice Questions (MCQs): 25 marks
2. Practical Skills Assessment: Three case scenarios with discussion; each case carries 20 marks (total 60 marks)
3. Logbook Maintenance: 15 marks

The candidate must appear and secure a minimum of 50% marks in each of the above listed components. The total marks are 100, and a minimum aggregate score of 50% is required to successfully complete the fellowship.

Any additional outputs or deliverables may be determined in consultation with the Guide and require prior written approval from the Selection Committee.

9. MINIMUM STANDARD AND CREDITS FOR THE AWARD OF THE FELLOWSHIP

- Fellows must maintain a **minimum of 80% attendance** across all program activities.
- A **minimum overall score of 50%** is required to pass the fellowship.

10. FELLOWSHIP COMPLETION CERTIFICATE

Issued by MRV: Upon successful completion of all training, periodic evaluations, and final examinations, fellows will be awarded a certificate.

The certificate should include details such as:

- Name of the candidate
- Fellowship program details
- Program completion status

Fellowship in Medical Devices & Wearables

Course Overview

The Fellowship in Medical Devices & Wearables is a comprehensive, application-driven program designed to equip learners with the scientific, technical, and regulatory competencies needed to conceptualize, design, prototype, test, evaluate, and validate medical devices and wearable health monitoring systems. The course covers physiological sensing, embedded systems, microcontroller integration, wireless communication, materials, biomedical instrumentation, simulation environments, device testing frameworks, compliance standards, and usability principles aligned with clinical workflows.

Through hands-on prototyping, sensor integration, printed circuit simulation, digital modeling, software-embedded applications, and biomedical validation exercises, participants learn end-to-end device lifecycle development from concept to deployment within real-world medical and rehabilitation environments.

Course Objectives

1. To provide foundational and applied knowledge of medical device systems, biosensors, and biocompatible technologies.
2. To develop practical competencies in sensor signal acquisition, embedded microcontroller design, wireless communication, and firmware development.
3. To impart skills for wearable system integration, physiological monitoring, power management, and real-time data transmission.
4. To introduce simulation, rapid prototyping, PCB design, testing, calibration, and validation for device safety and performance.
5. To familiarize learners with global regulatory standards (ISO 13485, IEC 60601, CDSCO, FDA/CE) and device approval requirements.
6. To prepare participants for innovation-led industry, research, and development roles in medical device engineering and digital health.

Curriculum with Part-wise Syllabus & Modules

Part 1: Foundations of Medical Devices & Wearables

Module	Topics Covered
Fundamentals of Medical Devices	Classification of devices; components; safety-critical design; IoT-enabled monitoring; biocompatibility principles
Physiological Sensing Systems	ECG/EMG/PPG/Temperature; motion tracking; respiration; optical sensing; acquisition interfaces
Embedded Electronics & Microcontrollers	Arduino, STM, ESP platforms; firmware design; ADC/DAC; communication buses (I2C, SPI, UART)
Signal Acquisition & Biomedical Processing	Analog conditioning; noise reduction; digital filtering; wavelet/transforms; real-time monitoring
Wireless Connectivity for Wearables	BLE, Wi-Fi, LoRa; data logging; IoT gateways; medical telemetry integration
Simulation & Rapid Prototyping	MATLAB, Proteus, KiCad; PCB design; enclosure modelling; 3D-printing for device casings

Part 2: Advanced Informatics, Analytics & Implementation

Module	Topics Covered
AI/ML for Wearable Health Data	Pattern extraction; anomaly detection; classification; deep learning-based health prediction
Human Factors & System Usability	Form factor, ergonomics, comfort, patient compliance, clinical usability studies
Regulatory Standards & Medical Safety	ISO 13485; IEC 60601; CDSCO norms; FDA/CE requirements; validation & documentation pathways
Device Testing, Calibration & Quality Assurance	SOP development; calibration procedures; reliability evaluation; sensor benchmarking
Clinical Workflow Integration & Deployment	ICU/ward/rehabilitation deployment; remote monitoring; emergency care adaptation
Capstone Project	Prototype demonstration; technical documentation; safety assessment; viva presentation

Program Outcomes

SR.N.	Program Outcome	Detailed Description
1	**Understanding Medical Device Ecosystems**	Demonstrate knowledge of device subsystems, sensing strategies, safety-critical design, and clinical application pathways
2	**Sensor Integration & Embedded System Competency**	Integrate sensors, signal conditioning, microcontrollers and wireless communication in a functional device
3	**Computational Intelligence for Biomedical Data**	Apply AI/ML/DSP techniques for physiological sensing interpretation and anomaly detection
4	**Regulatory & Safety Compliance Expertise**	Apply ISO/FDA/CE regulatory frameworks, device safety standards, and compliance documentation requirements
5	**Device Simulation & Prototyping Capability**	Use simulation, PCB tools, and rapid prototyping workflows to generate lab-validated outputs
6	**Clinical Workflow Adaptability**	Map devices to ICU, rehabilitation, monitoring, and chronic-care environments
7	**Innovation Orientation**	Apply design thinking to produce novel, clinically meaningful device solutions
8	**Practical Validation & Reporting**	Demonstrate testing, calibration, data documentation, and evaluation of system performance

Course Outcomes

	Course Outcome	Detailed Description
1	**Explain Principles of Medical Device Engineering**	Understand device structure, sensing mechanisms, biomedical requirements, safety constraints, and functional design pathways
2	**Integrate Sensors, Embedded Systems & Wireless Modules**	Interface physiological sensors with microcontrollers, firmware, and wireless connectivity for data acquisition and transmission
3	**Analyze Biosignals & Process Wearable Sensor Data**	Perform filtering, conditioning, feature extraction, and signal interpretation from wearable physiological data streams
4	**Apply AI/ML Methods to Physiological Monitoring**	Implement classification, anomaly detection, and predictive modeling using health-related biosignal data
5	**Prototype and Test Wearable Device Systems**	Use simulation, PCB modelling, and embedded integration to build and validate functional wearable prototypes
6	**Perform Regulatory Testing & Safety Validation**	Conduct safety assessment, calibration, device reliability evaluations, and

		regulatory-compliant documentation
7	**Implement Clinical Workflow Adaptive Designs**	Map device functionality to bedside monitoring, rehabilitation, emergency care, and chronic disease management
8	**Demonstrate Applied Engineering Through a Capstone**	Deliver a fully tested prototype with real-world validation, documentation, and final demonstration

Recommended Books & E-Resources
Textbooks:

- Medical Instrumentation & Design — Webster
- Fundamentals of Wearable Biopotential Monitoring — Huigen
- The Art of Electronics — Horowitz
- Embedded Systems Design — Vahid
- ISO 13485 Handbook — Regulatory Affairs

Journals & E-Resources:

- IEEE Xplore Medical Instrumentation
- IEC Standards Documentation
- CDSCO Guidelines
- FDA Medical Device Technical Resources
- MATLAB Biomedical Toolbox
- ROS/Embedded GitHub Open Libraries