SRINIVAS UNIVERSITY

# Mukka, Mangaluru – 574146

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**[In compliance of University Grants Commission (Minimum Standards and Procedures for Award of Ph.D. Degree) Regulations, 2016]**

**COURSEWORK SYLLABUS OF Ph.D. PROGRAMME IN**

 **ELECTRONICS AND COMMUNICATION**

**INSTITUTE OF ENGINEERING & TECHNOLOGY**

# Mukka, Mangaluru – 574 146.

**SRINIVAS UNIVERSITY**

**INSTITUTE OF ENGINEERING & TECHNOLOGY**

**Ph.D. PROGRAMME**

**SYLLABUS OF COURSEWORK**

### COURSEWORK PATTERN 400 Marks

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sl.****No.** | **Subjects** | **Exam (Hours)** | **Credits** | **Internal Marks** | **External Marks** | **Marks** |
| 1 | Research Methodology | 2 | 4 | 50 | 50 | 100 |
| 2 | Advanced Embedded System | 2 | 4 | 50 | 50 | 100 |
| 3 | Patent analysis and Presentation | 2 | 4 | 50 | 50 | 100 |
| 4 | Review of Literature leading to publish of review paper in journal | 2 | 4 | 50 | 50 | 100 |
| **Total** |  | **16** | **200** | **200** | **400** |

**COURSEWORK SYLLABUS**

**RESEARCH METHODOLOGY (22SPHDRM)**

**(COMMON TO ALL ENGINEERING BRANCHES)**

**Module-1:**

Meaning, Objectives and Characteristics of research - Research methods Vs Methodology - Types of research - Descriptive Vs. Analytical, Applied Vs. Fundamental, Quantitative Vs. Qualitative, Conceptual Vs. Empirical - Research process - Criteria of good research -Developing a research plan. Defining the research problem - Selecting the problem - Necessity of defining the problem -Techniques involved in defining the problem - Importance of literature review in defining a problem - Survey of literature - Primary and secondary sources – Development of working hypothesis.

**Module -2:**

Research design and methods – Research design – Basic Principles- Need of research design –– Features of good design – Important concepts relating to research design – Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction, Development of Models - Developing a research plan - Exploration, Description, Diagnosis, and Experimentation- Determining experimental and sample designs.

**Module -3:**

Sampling design - Steps in sampling design - Characteristics of a good sample design - Types of sample designs - Measurement and scaling techniques - Methods of data collection – Collection of primary data - Data collection instruments Testing of hypotheses - Basic concepts - Procedure for hypotheses testing flow diagram for hypotheses testing - Data analysis with Statistical Packages – Correlation and Regression - Important parametric test - Chi-square test - Analysis of variance and Covariance

**Module -4:**

IPRs- Invention and Creativity- Intellectual Property-Importance and Protection of Intellectual Property Rights (IPRs) - A brief summary of: Patents, Copyrights, Trademarks, Industrial Designs- Integrated Circuits-Geographical Indications-Establishment of WIPO-Application and Procedures.

**Module-5:**

Interpretation and report writing - Techniques of interpretation - Structure and components of scientific reports - Different steps in the preparation - Layout, structure and language of the report - Illustrations and tables - Types of report - Technical reports and thesis

**REFERENCES:**

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2021. An introduction to Research Methodology, RBSA Publishers.

2. Kothari, C.R., 2015. Research Methodology: Methods and Techniques. New Age International. 418p. 3. Anderson, T. W., An Introduction to Multivariate Statistical Analysis, Wiley Eastern Pvt., Ltd., New Delhi

4. Sinha, S.C. and Dhiman, A.K., 2012. Research Methodology, EssEss Publications. 2 volumes. se knowledge base, Atomic Dog Publishing.

5. Trochim, W.M.K., 2015. Research Methods: the conci 270p.

6. Fink, A., 2019. Conducting Research Literature Reviews: From the Internet to Paper. Sage Publications

7. Intellectual Property Rights in the Global Economy: Keith Eugene Maskus, Institute for International Economics, Washington, DC, 2019

8. Subbarau NR Handbook on Intellectual Property Law and Practice Publishing Private Limited.2008 S Viswanathan Printers.

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| **ADVANCED EMBEDDED SYSTEM** |
|  **Sub Code:** | **22SPHDEC01** | **IA Marks :** | **50** |
| **Exam Hours :** | **2** | **Exam Marks:** | **50** |
|  **Credits:** | **4** |  |  |
| **Course Objectives:** |
| * Identify the applicability of the embedded system.
* Comprehend the real time operating system used for the embedded system.
* To be familiar with the architecture and the instruction set of an ARM microprocessor
* Assembly language programming will be studied as well as the design of various types of digital and analog interfaces
 |
| **Course Outcomes:** |
| CO 1: Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.CO 2: Develop the hardware software co-design and firmware design approaches.CO 3: Explain the need of real time operating system for embedded system applications.CO 4: Describe the architectural features and instructions of 32 bit microcontroller ARM CortexM3CO 5: Apply the knowledge gained for Programming ARM Cortex M3 for different applications. |
| **Module I** |
|  **Embedded System**: Embedded vs General computing system, classification, application and purpose of ES. **Core of an Embedded System**: Memory, Sensors, Actuators, LED, Optocoupler, Communication Interface, Reset circuits, RTC, WDT, Characteristics and Quality Attributes of Embedded Systems.  |
| **Module II** |
| **Hardware Software Co-Design**: embedded firmware design approaches, computational models, embedded firmware development languages, Integration and testing of Embedded Hardware and firmware, Components in embedded system development environment (IDE), Files generated during compilation, simulators, emulators and debugging.   |
| **Module III** |
| **Real Time Operating System**: Task and Task states – Task and data – Semaphore and shared data operating system services – Message queues timing functions – Events – Memory management – Interrupt routines in an RTOS environment – Basic design using RTOS.   |
| **Module IV** |
| **ARM-32 bit Microcontroller**: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the architecture, General Purpose Registers, Special Registers, exceptions, interrupts, stack operation, reset sequence.   |
| **Module V** |
| **Instruction Sets**: Assembly basics, Instruction list and description, useful instructions, Memory Systems, Memory maps, Cortex M3 implementation overview, pipeline and bus interface.Exceptions, Nested Vector interrupt controller design, Systick Timer, Cortex-M3 Programming using assembly and C language, CMSIS .  |
| **TEXT BOOKS:**1. K. V. Shibu, "Introduction to embedded systems", TMH education Pvt. Ltd. 2009. 2. Joseph Yiu, “The Definitive Guide to the ARM Cortex-M3”, 2nd edn, Newnes, (Elsevier), 2010. **REFERENCE BOOKS:**1. James K. Peckol, "Embedded systems- A contemporary design tool", John Wiley, 2008
2. David. E.Simon, “An Embedded Software Primer”, Pearson Education, 2001
3. Rajkamal, Embedded Systems, 211d Edition, McGraw hill Publications, 2010.
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**PATENT ANALYSIS AND PRESENTATION (22SPHDEC02)**

The candidates should submit the review of literature of granted patents in the form of report and present the report in front of a Committee. The report carries 50% weightage and presentation carries 50% weightage.

**REVIEW OF LITERATURE LEADING TO PUBLISH OF REVIEW PAPER IN JOURNAL (22SPHDEC03)**

The candidates should submit the review of literature of published papers and publish this work in peer reviewed journals. The candidates should present the paper in front of a Committee. The published paper carries 50% weightage and presentation carries 50% weightage.

**EXAMINATION PATTERN**

For Research Methodology and Advanced Embedded System papers carries 50% weightage for assignments. The candidates are required to submit the hand written assignment given by the guide and it carries 50% weightage.

The examination will be conducted for remaining 50% marks. The question paper pattern will be as follows:

1. Two questions from each module will be asked in the examination and the candidates are required to answer any one question.
2. Each question will carry 10 marks.

**NOTE:** One online course in Research Methodology should be completed and the candidates are required to submit the certificate compulsorily.