Programme Specifications

Programme: Sensors and Control Systems Engineering

Department: Electrical Engineering

Faculty of Engineering & Technology

M. S. Ramaiah University of Applied Sciences

University House, New BEL Road, MSR Nagar, Bangalore – 560 054

www.msruas.ac.in

Programme Specifications: Sensors and Control Systems Engineering

Faculty	Engineering and Technology
Department	Electrical Engineering
Programme	Sensors and Control Systems Engineering
Dean of Faculty	Prof.H .K. Narahari
HOD	Prof. R. Hariharan

1. Title of the Award

M. Tech. in Sensors and Control Systems Engineering

2. Modes of Study

Full-Time ☒ Part-Time ☒

3. Awarding Institution /Body

M S Ramaiah University of Applied Sciences - Bangalore, India

4. Joint Award

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5. Teaching Institution

Faculty of Engineering and Technology (FET)

M S Ramaiah University of Applied Sciences - Bangalore, India

6. Date of Programme Specifications

February 2014

7. Date of Programme Approval by the Academic Council of MSRUAS

April 2014

8. Next Review Date

March 2016

9. Programme Approving Regulatory Body and Date of Approval

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10. Programme Accrediting Body and Date of Accreditation

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11. Grade Awarded by the Accreditation Body

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12. Programme Accreditation Validity

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13. Programme Benchmark

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14. Rationale for the Programme

The market for industrial automation and sensing technologies is increasing dynamically in today's world. Sensors are widely used in automobile, chemical, aerospace and manufacturing industries.

According to the market survey report prepared by a private firm, M&M - Texas, for the year 2013-2020, smart / intelligent sensor market is expected to generate revenue of $10.46 Billion by 2020; growing at an estimated CAGR of 36% from 2012-2020. In 2013, the Americas were the largest geography in terms of market revenue for the smart sensor market. China, India, Germany and the Middle East are providing impetus to the growth.

Control Systems, along with sensors, play a crucial role in industrial drives. The design of controllers and its real-time implementation envisage strong foundation in modern control theory.

Students will acquire knowledge and skills necessary to become a control system designer in the automotive, semiconductor, chemical, aerospace and other manufacturing industries as well as in the areas of power systems, communication networks, and computer software/hardware.

MSRUAS will have a significant role to provide a high-quality, state-of-the-art education in Sensors and Control Engineering that produces professionals capable of performing jobs in their fields of specialization at the highest level of quality and competitiveness. Seminars, workshops and research projects will also be actively conducted to expose students to emerging trends and advances in the field.

15. Programme Aim

The aim of the programme is to produce postgraduates with advanced knowledge and understanding of sensors and control systems design; higher order critical, analytical, problem solving and transferable skills; ability to think rigorously and independently to meet higher level expectations of sensors and control systems industry, academics, research or take up entrepreneurial route.

16. Programme Objectives

It prepares the students to model, simulate, analyse, and design sensors and control systems. The educational experience enables the students to achieve an integrated understanding of the software usage and analysis in the area of Sensors and Control Engineering

The objectives of the programme are to:

1. Impart knowledge on modelling of mechanical, electrical, hydraulic, pneumatic, thermal components and their combinations.

2. Teach control system models, state variable formulation and selection of appropriate control strategies to study system response, accuracy and stability.
3. Teach Non-linear, robust and adaptive control systems concepts and algorithms
4. Enable the students to use modelling and simulation software for analysis and design of control systems
5. Develop abilities to design control systems for a given application
6. Develop abilities to independently and jointly work on sensors and control systems projects with due attention to time and cost
7. Facilitate the students in teamwork, lifelong learning and continuous improvement

17. Intended Learning Outcomes of the Programme

The Intended Learning Outcomes (ILOs) are listed under four headings:

1. Knowledge and Understanding, 2. Cognitive Skills 3. Practical Skills and 4. Capability/Transferable Skills.

17.1 Knowledge and Understanding

After undergoing this programme, a student will be able to:

KU1: Explain factors influencing the choice of sensors for a given application

KU2: Describe specifications for data acquisition and hardware interfaces

KU3: Explain the design principles and modeling aspects of linear, non-linear, robust, adaptive and fuzzy control systems

KU4: Describe the practical aspects for implementing control systems

17.2 Cognitive Skills

After undergoing this programme, a student will be able to:

CS1: Design and characterize sensors for control applications

CS2: Model, simulate and analyze control components and systems

CS3: Design and develop hardware and algorithms for control applications

CS4: Analyse the performance of integrated control system including sensors and controllers

17.3 Practical Skills

After undergoing this programme, a student will be able to: PS1: Calibrate and characterise sensors

PS2: Use software tools for simulation of control systems and develop control algorithms

PS3: Implement data acquisition and hardware interfaces for the chosen control application

PS4: Develop and test integrated control system for a given application

17.4 Capability/Transferable Skills

After undergoing the programme, a student will be able to

TS1: Manage information, develop technical reports and make presentations

TS2: Build,Manage and Lead a team to successfully complete a project and communicate across teams and organizations to achieve professional objectives

TS3: Work under various constraints to meet project targets

TS4: Adopt to the chosen profession by continuously upgrading his/her knowledge and understanding through Life-long Learning philosophy

18. Programme Structure

A student is required to successfully complete the following modules for the award of the degree. The programme is delivered as per the Time-Table for every batch.

Programme: Sensors and Control Systems Engineering			
Module Code	**Modules**	**Credits**	**Duration (Weeks)**
	Department- Common Modules		
ECE501	1. Applied Mathematics	5	5
ECE502	2. Modelling and Analysis of Signals and Systems	5	5
ECE503	3. Modelling and Simulation of Electronic Circuits	5	5
	Programme - Specialization Modules		
SCE501	1. Sensors and Transducers	5	5
SCE502	2. Data Acquisition and Hardware Interfaces	5	5
SCE503	3. Linear Control Systems	5	5
SCE504	4. Non-linear and Adaptive Control Systems	5	5
SCE505	5. Neural and Fuzzy Control Systems	5	5
SCE506	6. Control System Design and Development	5	5
	Faculty-Common Modules		
FET501	1. Principles of Management and Soft Skills Development	3	3
FET502	2. Research Methodology	3	3
	Elective Module (Any One of 6)	5	5
FET503	1. Industry Internship		
FET504	2. Seminar		
FET505	3. Training		
FET506	4. Student Competition		
FET507	5. Visit to Industries and Exhibitions		
FET508	6. Teaching and Training		
SCE599	**Group Work-Project**	10	10
SCE600	**Dissertation**	30	26
	Mandatory Module (Any One)	4	4
FET509	1. Conference Publication		
FET510	2. Journal Publication		
		100	96

Note:
1. The Vacations and other activities shall be as per the Time-Table for the corresponding batch.

19. Module Delivery Structure- Full-Time

A module is delivered from Monday to Friday of the week. The lecture classes will be normally held from 9.30 AM to 1.00 PM with 30 minutes of break. The laboratory classes will be held in the afternoon from 2.00PM to 5.00 PM during the first two weeks of the module.

Week-1	Week-2	Week-3	Week-4	Week-5
Module Delivery	Module Delivery	Study Work	Study Work Examination	Assignment submission & Presentation

For Part-Time, the classes are normally held on Saturday and Sunday and the module delivery is for 8 weeks.

20. Teaching and Learning Methods

The module delivery comprises of combination of few or all of the following:

1. Face to Face Lectures using Audio-Visuals
2. Workshops, Group Discussions, Debates, Presentations
3. Demonstrations
4. Guest Lectures
5. Laboratory/Field work/Workshop
6. Industry Visit
7. Seminars
8. Group Exercises
9. Project Exhibitions
10. Technical Festivals

21. Elective Module

Elective module can be any one of the following -

FET503 Industry Internship

Internship is to be done with a company or any business or research organization for the module duration. The student is required to submit a report for assessment and also make a presentation to a team of examiners. The internship should be in the company related to the programme. A student is required to find internship on his/her own but the student placement office may assist in getting internship.

FET504 Seminar

A student can deliver a seminar of one hour duration of his/her original study on a contemporary topic after personal visits/survey/collection data. It should not be a collection of information from books/web resources and delivering a presentation/ preparing a report. Topic of seminar should be registered at the beginning of the elective module. At the end, seminar must be delivered to a team of examiners and also a word processed report must be submitted for assessment.

FET505 Training

A student can undergo training in any institution or any other organization in a specific subject area that falls under the broad category of his/her specialization. He/she need to submit a complete report on the training undergone and also make a presentation to a team of examiners for assessment.

FET506 Student Competition

A student can take part in a technical competition approved by the department; a

report shall be submitted followed by a presentation to a team of examiners for assessment.

FET507 Visit to Industries and Exhibitions
A student is required to make industry visits and international exhibitions as per the recommendations of the department and submit a report; and make a presentation to a team of examiners for assessment.

FET508 Teaching and Training
A student can teach a module in his / her area of specialization in any institute approved by the department. The student must submit the teaching notes and also make a presentation to a team of examiners for assessment.

FET509 Conference Publication
A student can submit a paper and make a presentation in a conference which is approved by the department. The same paper shall be presented for assessment and the student is required to make a presentation to a team of examiners for assessment.

FET510 Journal Publication
A student can publish a paper in a technical journal. The proof of submission and a copy of the paper shall be submitted to the department. It will be assessed based on a presentation to a team of examiners.

22. Group Project

SCE599 A group shall have up to 5 students. The purpose of group project is that the group should be able to design a product in their area of specialization and develop it. The students are required to develop a report for assessment and also need to demonstrate the working of the product. The IPR rights of all such work lies with the University only. The students are required to sign an agreement before the commencement of the project. The project should be approved by a committee of examiners before the start of the project. Students can choose a project from the database of projects available with the concerned department. The detailed procedure and evaluation procedure will be provided in Operation Manual / Student Handbook

23. Dissertation

SCE600 A student chooses a topic for the Dissertation from the database of the projects available with the concerned department. The detail procedure of executing and assessing Dissertation is available in the Student Handbook/Operations Manual.

24. Assessment and Grading

A module assessment will have two components:

Component - 1
Assignment 50% weight
Component -2
Examination 50% weight
(Note: For more details on the break-ups, please refer to the Module

Specifications)

A student is required to score a minimum of 40% in each of the components and an overall 40% for successful completion of a module and earning the credits.

Note: Final marks awarded in each of the modules will be confirmed only after SAB/PAB as explained in Academic Regulations of M.Tech. Programme.

25. Failure and Readmissions

If a student fails in a module, he/she is required to re-attend the module when offered next time by re-registering to the module.

26. Attendance

A student is required to have a minimum of 85% attendance to be eligible to write the examination. Less than 85% attendance is considered FAIL; such a student is required to follow the same procedure as that of a failed student.

Any condoning of shortfall of the attendance is as per the Academic Regulations for M.Tech. Programme.

27. Award of Class

As per the Academic Regulations for M.Tech. Programme.

28. Student Support for Learning

Student are given the following support:

1. Module notes
2. Reference books in the library
3. Magazines and Journals
4. Internet facility
5. Computing facility
6. Laboratory facility
7. Workshop facility
8. Staff support
9. Lounges for discussions
10. Any other support that enhances their learning

29. Quality Control Measures

Following are the Quality Control Measures:

1. Review of module notes
2. Review of question papers and assignment questions
3. Student feedback
4. Moderation of assessed work
5. Opportunities for the students to see their assessed work
6. Review by external examiners and external examiners reports

7. Staff student consultative committee meetings
8. Student exit feedback
9. Subject Assessment Board
10. Programme Assessment Board

30. Curriculum Map

Module Code	Intended Learning Outcomes											
	Knowledge and Understanding				Cognitive (Thinking) Skills (Critical, Analytical, Problem Solving, Innovation)				Practical Skills			
	KU1	KU2	KU3	KU4	CS1	CS2	CS3	CS4	PS1	PS2	PS3	PS4
ECE501			X									
ECE502	X	X	X			X						
ECE503		X		X			X					
SCE501	X			X	X				X			
SCE502		X		X			X				X	
SCE503			X	X		X				X		
SCE504			X	X		X				X		
SCE505			X	X		X				X		
SCE506				X	X	X	X	X	X	X	X	X
FET501												
FET502					X	X	X	X				
FET503	X	X	X	X	X	X	X	X	X	X	X	X
FET504					X	X	X	X				
FET505	X	X	X	X	X	X	X	X	X	X	X	X
FET506					X	X	X	X				
FET507	X	X	X	X								
FET508	X	X	X	X	X	X	X	X				
FET509					X	X	X	X	X	X	X	X
FET510					X	X	X	X	X	X	X	X
SCE599	X	X	X	X	X	X	X	X	X	X	X	X
SCE600	X	X	X	X	X	X	X	X	X	X	X	X

31. Capability / Transferable Skills Map

Module Code	Group work	Self learning	Research Skills	Written Communication Skills	Verbal Communication Skills	Presentation Skills	Behavioral Skills	Information Management	Personal management/ Leadership Skills
ECE501		X		X	X	X		X	
ECE502		X		X	X	X		X	
ECE503		X		X	X	X		X	
SCE501		X		X	X	X		X	
SCE502		X		X	X	X		X	
SCE503		X		X	X	X		X	
SCE504		X		X	X	X		X	
SCE505		X		X	X	X		X	
SCE506	X	X	X	X	X	X		X	X
FET501	X	X		X	X	X	X	X	X
FET502		X	X	X	X	X		X	X
FET503	X	X		X	X	X		X	X
FET504		X	X	X	X	X		X	
FET505		X		X	X	X		X	
FET506	X	X		X	X	X		X	X
FET507		X		X	X	X		X	
FET508		X		X	X	X		X	
FET509	X	X	X	X	X	X		X	X
FET510	X	X	X	X	X	X		X	X
SCE599	X	X	X	X	X	X		X	X
SCE600		X	X	X	X	X		X	

32. Co-curricular Activities

Students are encouraged to take part in co-curricular activities like seminars, conferences, symposium, paper writing, attending industry exhibitions, project competitions and related activities to enhance their knowledge and network.

33. Cultural and Literary Activities

To remind and ignite the creative endeavors annual cultural festival is held and the students are made to plan and organize the activities.

34. Sports and Athletics

Students are encouraged to develop a habit of taking part in outdoor and indoor games on regular basis.