



**SRI MANAKULA VINAYAGAR**  
**ENGINEERING COLLEGE**  
(An Autonomous Institution)  
Puducherry - 605 107

**Department of Electronics and Communication Engineering**

---

**Minutes of 4th BoS Meeting**

---

for B.Tech – Electronics and Communication Engineering

**Venue:** Seminar Hall, Department of ECE  
Sri Manakula Vinayagar Engineering College  
Madagadipet, Puducherry – 605 107

**Date & Time:** 26<sup>th</sup> February 2022 & 10.30 am

### Minutes of 4<sup>th</sup> Board of Studies Meeting

The Fourth meeting of Board of Studies for B.Tech. Electronics and Communication Engineering was held on 26<sup>th</sup> February 2022 at 10:30 am in the Seminar Hall, Department of ECE, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

**The following members were present for the BoS meeting in the venue**

Sl. No	Name of the Member	Designation
1	<b>Dr. P. Raja</b> Professor and Head, Department of ECE	Chairman
2	<b>Mr. C. Gnanavel</b> General Manager, Production and Technology, Lenovo India Ltd., Puducherry	Industry Member
3	<b>Dr. V. Bharathi,</b> <b>Specialization:</b> Wireless Communication	Internal Member
4	<b>Dr. R. Ramya,</b> Professor/ ECE <b>Specialization:</b> ECE	Internal Member
5	<b>Dr. J. Pradeep,</b> Associate Professor / ECE <b>Specialization:</b> Image Processing	Internal Member
6	<b>Dr. R. Kurinjimalar,</b> Associate Professor / ECE <b>Specialization:</b> Mobile Satellite Communication	Internal Member
7	<b>Dr.N.Jothy</b> Associate Professor / ECE <b>Specialization:</b> Wireless Communication	Internal Member
8	<b>Prof.R.Illayaraja</b> Assistant Professor <b>Specialization:</b> VLSI Design	Internal Member
9	<b>Prof. Egalite Francis,</b> Assistant Professor <b>Specialization:</b> Mathematics	Internal Member
10	<b>Prof. K. Oudayakumar,</b> Associate Professor <b>Specialization:</b> Physics	Internal Member
11	<b>Dr. S. Deepa,</b> Professor <b>Specialization:</b> Chemistry	Internal Member
12	<b>Dr. D. Jaichithra,</b> Professor and Head <b>Specialization:</b> English	Internal Member
13	<b>Mr. G. Dharanidharan</b> Associated Functional Consultant, Birlasoft Limited, Old Mahabalipuram Road, Chennai – 600096	Alumni Member

**The following members were present in the online platform**

Sl. No	Name of the Member	Designation
1	<b>Dr. Gerardine Immaculate Mary</b> Professor, Department of Embedded Systems, Vellore Institute of Technology (VIT), Vellore, Tamil Nadu, India	Expert Member (University Nominee)
2	<b>Dr. N. Venkateswaran</b> Professor, Department of ECE, SSN - College of Engineering, Kalavakkam, Tamil Nadu, India	Expert Member (Academic Council Nominee)

3	<b>Dr. V. R. Vijayakumar</b> Associate Professor & Head, Department of ECE, Anna University, Regional Campus, Coimbatore	Expert Member (Academic Council Nominee)
---	--	---

## AGENDA OF THE MEETING

### BoS / 2022/ UG / ECE / 4.1

To review and confirm the minutes of the third BoS meeting held on 28<sup>th</sup> August 2021

### BoS / 2022/ UG / ECE / 4.2

To consider and approve syllabi of VII and VIII semesters of B.Tech. ECE to be offered under Regulations 2020 for the students admitted in the academic year 2020 - 21

### BoS / 2022/ UG / ECE / 4.3

To discuss and approve the Professional electives offered in VII and VIII semesters for the students admitted in the Academic Year 2020-21 as per Regulations 2020

### BoS / 2022/ UG / ECE / 4.4

To ratify the professional and open electives chosen by VI semester students admitted for the academic year 2019–20 in accordance with Regulations 2019

### BoS / 2022/ UG / ECE / 4.5

To ratify the online certification courses like SWAYAM / Coursera/EdX which is mandatory to the students in 6<sup>th</sup> semester under Regulations 2019 for the students admitted in the academic year 2019-20

### BoS / 2022/ UG / ECE / 4.6

Any other item with the permission of the chair

## MINUTES OF THE MEETING

Dr. P. Raja, Chairman, BoS opened the meeting with a warm welcome and thanked all the members for accepting the 4<sup>th</sup> BoS meeting invitation for the B.Tech – Electronics and Communication Engineering program. The Chairman proceeded to the meeting subsequently and discussed the agenda items.

### BoS / 2022/ UG / ECE / 4.1

#### To review and confirm the Third BoS meeting minutes held on 28.08.2021

The third BoS Meeting for B.Tech.-Electronics and Communication Engineering was held on August 28, 2021. The members have reviewed the minutes of the meeting and approved.

**Minutes are Reviewed and Confirmed**



**To consider and approve syllabi of VII and VIII semesters of B.Tech. ECE to be offered under Regulations 2020 for the students admitted in the academic year 2020 - 21**

Members have discussed the syllabi of semesters VII and VIII of B.Tech- Electronics and Communication Engineering under Regulation 2020, and the suggestions are given in course wise.

**Courses wise suggestions of the semester- VII under Regulations 2020**

S.No	Course Name with Code	Unit	Suggestions given and Changes incorporated
1	Internet of Things (U20ECT717)	V	Provide Internet of Things protocols and also suggested to include various applications
2	High Frequency Communication Laboratory (U20ECP713)	-	Execute any 12 experiments out of 16, based on the allotment of number of hours for the laboratory to match with the academic schedule
3	Internet of Things Laboratory (U20ECP714)	-	Include any IOT security and Attack Experiments, But members again concluded that it becomes difficult in executing IoT Attack, so Awareness about security and Attack can be provided to the students
4	Comprehensive Viva Voce(U20ECP715)	-	Clarification of marks provided to the Comprehensive Viva Voce, and the chairman informed that equal weightage of marks had been provided for all the test

**Courses wise suggestions of the semester- VIII under Regulations 2020**

S.No	Course Name with Code	Unit	Suggestions given and Changes incorporated
1	Project Phase - II (U20ECW803)	-	Slightly enlarging the content of Project Phase –II Syllabus, since the credit point is 8 and detailed description to be done
2	Skill Development Course (NPTEL/MOOC-II)		Clarify the mark allocation provided to the students attending the skill development course

All the suggestions are considered and incorporated in the respective courses. The details are given in **Annexure - 1**

**Approved with minor corrections and Forwarded to the Academic Council**



**To discuss and approve the professional electives offered in VII and VIII semesters for the students admitted in the Academic Year 2020-21 as per Regulations 2020**

As per the Regulations, each student shall choose one professional elective in semester VII and two professional electives in semester VIII in consultation with the Class Advisor, Programme Academic Coordinator and the HoD. The opted elective course will be offered only if the number of students opted for that course is not less than 30. However, if the students' enrollment in a class is less than 30, the head of the department will decide the elective course.

Members have discussed the syllabi professional elective courses offered in semesters VII and VIII of B.Tech- ECE under Regulations 2020, and the suggestions are given in course wise.

**Professional Elective IV (U20ECE7XX) under Regulations 2020**

S.No	Course Name with Code	Unit	Suggestions given and Changes incorporated
1	Satellite Communication (U20ECE717)	V	Recent trends of Micro and Nanosatellite topic may be included
2	Fuzzy logic and Neural Network (U20ECE718)	V	Include appropriate applications in Fuzzy and Neural Network
3	Biomedical Signal Processing (U20ECE719)	V	Brain-Computer Interface and advised to replace as simple application
4	Wireless Sensor Networks (U20ECE720)	-	Reduce the content provided in the syllabus since the content is too heavy

**Professional Elective VI (U20ECE7XX) under Regulations 2020**

S.No	Course Name with Code	Unit	Suggestions given and Changes incorporated
1	Biomedical Electronics (U20ECE828)	V	Basic diagnostic to be removed and update the edition of text books
2	Advanced Digital Image Processing (U20ECE829)	IV	Title of unit may renamed as "Multimedia Processing"

All the suggestions are considered and updated in the respective courses. The details are given in **Annexure - 2**

**Approved with Minor corrections and Forwarded to the Academic Council**

**To ratify the professional and open electives chosen by VI semester students admitted for the academic year 2019–20 in accordance with Regulations 2019**

Members Appreciated the certification courses offered in the VI<sup>th</sup> semester under Regulations 2019

Professional electives opted by the students

Sl. No.	Course Code	Course Title	Number of Students Registered
1	U19ECE61	Low Power VLSI Design	-
2	U19ECE62	Aircraft communication and Navigation Systems	71
3	U19ECE63	Nano Electronics and Devices	71
4	U19ECE64	Speech and Audio Signal Processing	-
5	U19ECE65	Soft Computing	70

Open electives opted by the students

Sl. No.	Course Code	Course Title	Offering Department	Number of Students Registered
1	U19ITO63	Essentials of Data Science	IT	70
2	U19ITO64	Mobile App Development	IT	71
3	U19ADO61	Principle of Artificial Intelligence and Machine Learning	AI&DS	71
4	U19BMO63	Biometric Systems	BME	-
5	U19CCO63	Network Essentials	CCE	-
6	U19EEO63	Conventional and Non-Conventional Energy Sources	EEE	-
7	U19EEO64	Industrial Drives and Control	EEE	-
8	U19ICO63	Fuzzy logic and neural networks	ICE	-
9	U19ICO64	Measurement and Instrumentation	ICE	-

List of students opted Professional and Open Electives in Annexure – 3

**Noted and Approved**

To ratify the online certification courses like SWAYAM / Coursera/EdX which is mandatory to the students in 6th semester under Regulations 2019 for the students admitted in the academic year 2019-20

Members Appreciated the online certification courses like SWAYAM / Coursera /EdX which is mandatory to the students in 7<sup>th</sup> semester

Members suggested to validate the marks for all the students in equal format, with the Consideration of course duration

Sl. No.	Course Title	Duration	Number of Students Registered
1	A brief course on Superconductivity	4 weeks	-
2	A brief introduction of Micro - Sensors	4 weeks	8
3	Awareness Programme on Solar Water Pumping System	4 weeks	-
4	Design Thinking - A Primer	4 weeks	9
5	Educative Media	4 weeks	-
6	User Interface Design	4 weeks	-
7	Python for Data Science	4 weeks	83
8	Introduction to Machine Learning (Tamil)	4 weeks	-
9	Electric Vehicles - Part 1	4 weeks	54
10	Electronic Waste Management - Issues and Challenges	4 weeks	45
11	Medical Image Analysis	4 weeks	-
12	Software Conceptual Design	4 weeks	-
13	Linux for Sys-Ads	4 weeks	-
14	Awareness Programme on Solar Water Pumping System	4 weeks	13

**Noted and Approved**



**Any other item with the permission of the chair**

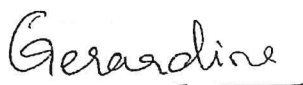
- Members suggested to receive feedback from the students about the Professional Electives (virtual and Augmented Reality)
- Members are also suggested to get overall feedback about the curriculum and syllabi and modify if necessary
- Members are appreciated for different types of Professional Elective for the students which will improve the interdisciplinary knowledge
- Syllabus formation is highly suitable and meets the industry requirements.
- Members suggested checking the possibilities of introducing the internship/inplant training programme in the VI<sup>th</sup> semester because the students may get industry exposure and it is very useful to execute the industry-based projects in the 7<sup>th</sup> semester onwards.
- Very well-defined syllabus and more topics are based on advanced future technology.

**Minutes are Reviewed and Confirmed**

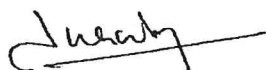
Dr. P. Raja, Chairman – BoS and Head of Department, Electronics and Communication Engineering, concluded the meeting at 12.30 pm with the vote of thanks.



**Dr. P. RAJA**  
Board Chairman - ECE



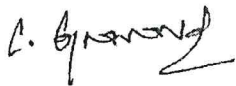
**Dr. GERARDINE IMMACULATE MARY**  
Professor, Department of Embedded Systems,  
Vellore Institute of Technology (VIT), Vellore  
(Expert Member - University Nominee)



**Dr. N. VENKATESWARAN**  
Professor, Department of ECE,  
SSN College of Engineering, Kalavakkam  
(Expert Member – AC Nominee)

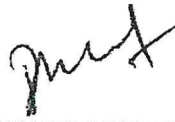


**Dr. V. R. VIJAYAKUMAR**  
Associate Professor & Head, Department of  
ECE, Anna University, Regional Campus,  
Coimbatore  
(Expert Member – AC Nominee)



**Mr. C. GNANAVEL**

Manager, Production and Technology,  
Lenovo India Ltd., Puducherry  
(Industry Member)



**Mr. DHARANIDHARAN. G**

Associated Functional Consultant,  
Birlasoft Limited, Chennai  
(Alumni Member)



**Dr. R. RAMYA**  
Professor/ ECE  
(Member)



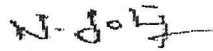
**Dr. V. BHARATHI**  
Professor / ECE  
(Member)



**Dr. J. PRADEEP**  
Associate Professor / ECE  
(Member)



**Dr. R. KURINJIMALAR**  
Associate Professor / ECE  
(Member)



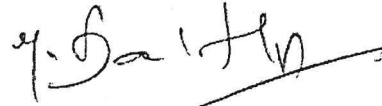
**Dr. N. JOTHY**  
Associate Professor / ECE  
(Member)



**Prof. R. Illayaraja**  
Assistant Professor / ECE  
(Member)



**Prof. K. OUDAYAKUMAR**  
Associate Professor / Physics  
(Member)



**Prof. EGALITE FRANCIS**  
Assistant Professor / Mathematics  
(Member)



**Dr. D. JAICHITHRA**  
Professor / English  
(Member)



**Dr. S. DEEPA**  
Professor / Chemistry  
(Member)





SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20ECT716	Millimeter and Optical Wave Communication	PC	3	0	0	3	25	75	100
2	U20ECT717	Internet of Things	PC	3	0	0	3	25	75	100
3	U20ECE7XX	Professional Elective – IV	PE	3	0	0	3	25	75	100
4	U20XXO7XX	Open Elective - IV	OE	3	0	0	3	25	75	100
Practical										
5	U20HSP703	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U20ECP713	High Frequency Communication Laboratory	PC	0	0	2	1	50	50	100
7	U20ECP714	Internet of Things Laboratory	PC	0	0	2	1	50	50	100
8	U20ECP715	Comprehensive Viva Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U20ECW701	Project Phase – I	PW	0	0	4	2	50	50	100
10	U20ECW702	Internship / Inplant Training	PW	0	0	0	2	100	-	100
Mandatory Course										
11	U20ECM707	Professional Ethics	MC	2	0	0	-	100	-	100
							20	600	500	1100

  
 Dr. P. RATHA

U20ECT717

**INTERNET OF THINGS**

L	T	P	C	Hours
3	0	0	3	45

**Course Objectives**

- To impart necessary and practical knowledge of components of Internet of Things.
- To attain the knowledge about different types of architecture and their elements of IoT.
- To understand the concepts of integration of devices and data's.
- To acquire the knowledge about remotely monitor data and control devices.
- To develop skills required to build real-time IoT based projects.

**Course Outcomes**

After completion of the course, students will be able to

**CO1-**Describe the Internet of Things and its hardware and software components. **(K2)**

**CO2-**Summarise the Interface I/O devices, sensors & communication modules. **(K2)**

**CO3-**Explain the concepts of remotely monitor data and control devices. **(K2)**

**CO4-**Construct and deploy various architecture with their elements. **(K3)**

**CO5-**Demonstrate the real time IoT based projects. **(K3)**

**UNIT – I INTRODUCTION TO INTERNET OF THINGS****(9 Hrs)**

The technology of the internet of things, making the internet of things, Elements of an IoT ecosystem, design principles for connected devices, Web thinking for connected devices.

**UNIT -II ARCHITECTURE OF IoT****(9 Hrs)**

Architectural Overview, Design principles and needed capabilities, IoT Applications, Sensing, Actuation, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service(XaaS), Role of Cloud in IoT, Security aspects in IoT-Protocols.

**UNIT - III ELEMENTS OF IoT****(9 Hrs)**

Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces.

Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols- MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

**UNIT - IV IoT APPLICATION DEVELOPMENT****(9 Hrs)**

Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices

**UNIT -V IoT APPLICATIONS****(9 Hrs)**

Smart Lighting – Home Intrusion Detection- Smart Parking - Weather Monitoring System - Weather Reporting Pot- Air Pollution Monitoring – Forest Fire Detection- Smart Irrigation –IoT Printer

**Text Books**

1. Vijay Madiseti, ArshdeepBahga, Internet of Things, "A Hands on Approach", University Press ,3rd/e ,Aug 2018.
2. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill ISBN: 9789352605224, 9789352605224, 2<sup>nd</sup> edition, May 2017
3. Dr. SRN Reddy, RachitThukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs 2021

**Reference Books**

1. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2021
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013
3. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill, 2017
4. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media, 2015
5. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

**Web Resources**

1. <https://www.i-scoop.eu/internet-of-things-guide/>
2. <https://www.theinternetofthings.eu/>
3. <https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/>
4. <https://www.coursera.org/learn/iot>
5. [https://onlinecourses.nptel.ac.in/noc21\\_ee85/preview](https://onlinecourses.nptel.ac.in/noc21_ee85/preview)

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	2	-	-	-	-	-	-	-	-	3	3	-
2	3	-	3	2	-	-	-	-	-	-	-	-	3	2	-
3	2	3	2	-	-	-	-	-	-	-	-	-	2	2	-
4	2	2	2	-	-	-	-	-	-	-	3	-	3	3	-
5	2	3	2	-	3	-	-	-	-	-	3	-	3	3	-

Correlation Level: 1-Low, 2-Medium, 3-High



U20ECP713	<b>HIGH FREQUENCY COMMUNICATION LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Hours</b>
		0	0	3	1	45

### Course Objectives

- To enable the student to verify the basic principles and design aspects involved in
- High frequency band pass communication system components design and the performance parameters for the components and the overall system.
- To enable the student to gain insight into the practical aspects of radiation phenomena and thoroughly understand the radiation characteristics of different types of antennas. To enable the student to appreciate the practical aspects of band pass system design
- Understand the associated link power and rise time budgeting challenges and enable them to design and conduct experiments, as well as to analyze and interpret data to produce meaningful conclusions and match with theoretical concepts
- To enable the student to gain knowledge in optical devices

### Course Outcomes

After completion of the course, students will be able to

- CO1-** The student would be able to design and conduct experiments to demonstrate the trade-offs involved in the design of high frequency band pass communication links and the associated components. **(K4)**
- CO2-** The student would be able to comprehensively record and report the measured data, and would be capable of analyzing and interpreting the experimental measurement data and produce meaningful conclusions **(K4)**
- CO3-** The students will be able to acquire knowledge about the Spectral Characterization of Optical Sources **(K4)**
- CO4-** Acquiring practical skills to measure the microwave filter characteristics **(K4)**
- CO5-** Understanding the design and testing of Antennas **(K2)**

### LIST OF EXPERIMENTS

Any 12 experiments to be conducted

1. Characterization of Glass and Plastic Optical Fibers - Measurement of Numerical Aperture and Attenuation, Coefficient OTDR Principle
2. DC Characteristics of LEDs and PIN Photodiodes - Determination of external power Efficiency and dark current of detector Responsivity
3. P-I of LED Characteristics of Laser Diode Sources - Threshold Current Determination and Study of Temperature Effects
4. Gain Characteristics of APDs – Determination of Threshold Voltage and Average gain estimation
5. Analog Transmission Characteristics of a Fiber Optic Link – Determination of Operating Range of LED and System Bandwidth for Glass and Plastic fiber links and determination of device capacity of photo detection
6. Determination of Capacity of a Digital Fiber Optic Link – Maximum Bit Rate estimation for Glass and Plastic fiber links
7. Spectral Characterization of Optical Sources – Determination of Peak Emission Wavelength and Spectral Width
8. Study of WDM Link Components – WDM Mux / Demux, Isolator, Circulator, Fiber Bragg Grating, EDFA.
9. Gain and Radiation Pattern Measurement of an Antenna - Horn Antenna, Dipole Antenna, Array Antenna,
10. Log-Periodic Antenna, Loop Antenna
11. Determination of Mode Characteristics of a Reflex Klystron Oscillator
12. VSWR and Impedance Measurement and Impedance Matching
13. Dielectric Constant Measurement

14. Characterization of Directional Couplers and Multiport junctions
15. Gunn Diode Characteristics
16. Microwave IC – Filter Characteristics

10/

**Reference Books**

1. HemaniKaushal, V.K. Jain, SubratKar, "Free Space Optical Communication", Springer India, New Delhi, 2017.
2. Govind P. Agrawal, "Fiber-Optic Communication Systems", John Wiley & Sons, reprint, 3rd Edition, 2012.
3. Sergey M. Smolskiy Author, Leonid A. Belov and Victor N. Kochemasov, "Handbook of RF, Microwave, and Millimeter-Wave Components", Artech House Microwave Library, 2012.
4. Shahid Mumtaz, Jonathan Rodriguez, Linglong Dai, "mmWave Massive MIMO: A Paradigm for 5G" Academic Press, 2016
5. Su-Khiong Yong, Pengfei Xia, Alberto Valdes-Garcia, "60GHz Technology for Gbps WLAN and WPAN: From Theory to Practice", Wiley, 1st Edition, 2011

**Web Resources**

1. [https://onlinecourses.nptel.ac.in/noc21\\_ee102/preview](https://onlinecourses.nptel.ac.in/noc21_ee102/preview)
2. [https://onlinecourses.nptel.ac.in/noc20\\_ee71/preview](https://onlinecourses.nptel.ac.in/noc20_ee71/preview)
3. <https://nptel.ac.in/noc/courses/noc17/SEM1/noc17-ec04/>
4. <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470889886>
5. <https://assets.thalia.media/images-adb/8b/64/8b644a3e-cf4e-482f-882e-e14500f9f684.pdf>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	2	3	3	2	2	-	-	-	-	-	1	3	-	-
2	2	2	3	3	2	2	-	-	-	-	-	1	3	-	-
3	2	2	3	3	2	2	-	-	-	-	-	1	3	-	-
4	2	2	3	3	2	2	-	-	-	-	-	1	3	-	-
5	2	2	3	3	2	2	-	-	-	-	-	1	3	-	-

Correlation Level: 1-Low, 2-Medium, 3-High



U20ECP714

**INTERNET OF THINGS LABORATORY**

L	T	P	C	Hours
0	0	3	1	45

**Course Objectives**

- To impart necessary and practical knowledge of components of Internet of Things.
- To attain the knowledge about different types of architecture and their elements of IoT.
- To understand the concepts of integration of devices and data's.
- To acquire the knowledge about remotely monitor data and control devices.
- To develop skills required to build real-time IoT based projects.

**Course Outcomes**

After completion of the course, students will be able to

**CO1**-Understand internet of Things and its hardware and software components.

**CO2**-Can learned about Interface I/O devices, sensors & communication modules.

**CO3**-Understand the concepts of remotely monitor data and control devices.

**CO4**-Build and deploy an various architecture with their elements.

**CO5**-Can develop real life IoT based projects.

**LIST OF EXPERIMENTS****Cycle I : Sensor interfacing (Any 6 Experiments)**

1. Familiarization with Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface OLED with Raspberry Pi and write a program to print temperature and humidity readings using DHT11 sensor.
5. To interface DC motor using motor driver circuit with Raspberry Pi and write a program to rotate motor in clockwise and anticlockwise.
6. To interface Bluetooth with Raspberry Pi and write a program to turn Relay ON/OFF when '1'/'0' is received from smartphone using Bluetooth module.
7. Write a program on Raspberry Pi to upload temperature and humidity data to thingspeak cloud and retrieve data from thingspeak cloud.

**Cycle II : Server Configuration (Any 6 Experiments)**

8. To install MySQL database on Raspberry Pi and perform basic SQL queries.
9. Write a program on Raspberry Pi to publish temperature data to MQTT broker.
10. Write a program on Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
11. Write a program to create TCP server on Raspberry Pi and respond with humidity data to TCP client when requested.
12. Write a program to create UDP server on Raspberry Pi and respond with humidity data to UDP client when requested.
13. Write Program for Security in IoT Based System
14. LoRaWAN Configuration to share the data in cloud.

**Reference Books**

1. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2021
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2015
3. Raj Kamal, "Internet of Things: Architecture and Design", McGraw Hill, 2017
4. CunoPfister, "Getting Started with the Internet of Things", O Reilly Media, 2015
5. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press

**Web Resources**

1. <https://www.i-scoop.eu/internet-of-things-guide/>
2. <https://www.theinternetofthings.eu/>
3. <https://www.udemy.com/course/complete-guide-to-build-iot-things-from-scratch-to-market/>
4. <https://www.coursera.org/learn/iot>
5. [https://onlinecourses.nptel.ac.in/noc21\\_ee85/preview](https://onlinecourses.nptel.ac.in/noc21_ee85/preview)

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	3	2	2
2	2	1	-	-	3	-	-	-	-	-	-	-	3	3	2
3	3	2	1	1	3	-	-	-	-	-	-	-	3	2	2
4	3	2	1	1	3	-	-	-	-	-	-	-	3	3	3
5	3	2	1	1	3	-	-	-	-	-	-	-	3	3	3

Correlation Level: 1-Low, 2-Medium, 3-High




**U20ECP715****COMPREHENSIVE VIVA VOCE**

L	T	P	C	Hours
0	0	3	1	45

The student will be tested for his/her understanding of the basic principles of the core engineering subjects. The internal assessment for a total of 50 marks will be made by a committee comprising of the faculty members of the department. 40 Marks are allocated for four tests and 10 marks for attendance. The committee will conduct four written examinations of short questions/ Objective type / descriptive type from the subjects

- Test 1 - Analog and Digital Electronic Circuits and Electric Circuits (10 Marks)
- Test 2 – Microprocessor and Microcontrollers, Signal Processing and VLSI(10 Marks)
- Test 3 - Electromagnetic Waves and Waveguides, Antennas and Control Systems (10 Marks)
- Test 4 - Analog and digital communication, advanced communication systems. (10 Marks)

The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the Controller of Examinations





U20ECW701

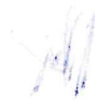
**PROJECT PHASE - I**

L	T	P	C	Hours
0	0	4	2	45

Each batch of 2 or 3 students will be assigned an experimental or a theoretical project to be carried out under the supervision of a guide. The project work has to be carried out in the 7<sup>th</sup> and 8<sup>th</sup> semesters and has to be completed by the end of the 8<sup>th</sup> semester.

Students opting for industry / research organization project should decide, identify and interact with relevant industry/ research organization in 7<sup>th</sup> semester itself. Training and Placement cell shall help to establish contact with industries. Students shall take necessary help from their department for exact plan of action and apply to the industry / research organization through proper channel. The departmental committee shall decide the schedule appropriately. Students shall submit the application attached with relevant details viz. correspondence with industry, area and nature of project, progress report to the department before the end of 7<sup>th</sup> semester.

In the phase I of the project work, the progress of the work carried out in the 7<sup>th</sup> semester will be monitored and assessed internally for a total of 50 marks. A committee of departmental faculty members comprising the project guide, the Head of the Department and one more faculty member will conduct the internal assessment. The external end semester examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the Controller of Examinations



SEMESTER – VIII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U20ECT818	Cyber Physical System	PC	3	0	0	3	25	75	100
2	U20ECE8XX	Professional Elective – V	PE	3	0	0	3	25	75	100
3	U20ECE8XX	Professional Elective – VI	PE	3	0	0	3	25	75	100
Practical										
4	U20HSP804	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
5	U20ECW803	Project phase – II	PW	0	0	16	8	40	60	100
Employment Enhancement Course										
6	U20ECS809	Skill Development Course 9: NPTEL/MOOC-II	MC	0	0	0	-	100	-	100
							18	315	285	600

  
P. RAJA

U20ECW803

## PROJECT PHASE - II

L	T	P	C
0	0	16	8

The work on project extension and completion had begun in the previous semester. In the eighth semester, students will be authorized to perform project work in the industry for a maximum of 13 weeks. The students will be assigned an internal guide from the department as well as a mentor from the industry/research organization where the project will be completed. Both guides should discuss and agree on the scope of the project's work, as well as track its progress.

Internal guides should visit the industry at least three times per semester to monitor the progress of their students, and a concise report on the project should be sent to the HoD. At least twice a month, students should keep track of their progress and seek approval from both internal and external advisors, either in person or via email conversation. If the progress is not satisfactory for any reason, the Guide should take corrective action after speaking with the Dean Academics through the HoD for a longer project completion period.

The student must submit a progress report and a certificate of completion of the project work from the industry / research organization to the respective guide. The evaluation method will be the same as that used for students working on an in-house project. Students complete their in-house project in the Department after receiving formal approval from the HoD via the appropriate supervisor. Each student must produce a project report and submit it to the department once the project work is completed.

The project work and report will be reviewed by the internal evaluation committee in Phase II, which will perform two reviews and one demo for a total of 40 points. A committee of one external examiner and one internal examiner designated by the Controller of Examinations will conduct a report evaluation and viva voce examination for 50 marks during the external end semester examination, which carries a total of 60 marks. Publication of papers, prototypes, and patents is worth ten points.





**U20ECS809****SKILL DEVELOPMENT COURSE 9**  
( NPTEL / MOOC - II )

L	T	P	C	Hrs
0	0	4	-	50

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.



Professional Elective – IV ( Offered in Semester VII)		
Sl. No.	Course Code	Course Title
1	U20ECE716	CAD for VLSI Circuits
2	U20ECE717	Satellite Communication
3	U20ECE718	Fuzzy logic and Neural Network
4	U20ECE719	Biomedical Signal Processing
5	U20ECE720	Wireless Sensor Networks

  
P. RAJA





U20ECE717

**SATELLITE COMMUNICATION**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Hrs</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>

**Course Objectives**

- To give exposure on the basics of satellite orbits.
- To understand satellite segment and earth segment
- To learn about the various methods of satellite access
- To study the of the applications of satellites
- To recognize the concepts of the basics of satellite Networks

**Course Outcomes**

*After completion of the course, the students will be able to*

- CO1- Explain the basics of satellite orbits. (K2)
- CO2- Summarize the satellite segment and earth segment. (K2)
- CO3- Analyze the satellite Link design(K3)
- CO4- Interpret the working principle of various methods of satellite access. (K2)
- CO5- Discuss the various satellite applications. (K2)

**UNIT - I SATELLITE ORBITS****(9Hrs)**

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non-Geo-stationary orbits – Look Angle Determination- Limits of visibility –Eclipse -Sub satellite point –Sun transit Outage-Launching Procedures - launch vehicles and propulsion

**UNIT - II SPACE SEGMENT AND EARTH SEGMENT****(9Hrs)**

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and Command-Transponders-The Antenna Subsystem. Earth segment- Transmit-Receive Earth Station.

**UNIT - III SATELLITE LINK DESIGN****(9Hrs)**

The space link, Equivalent Isotropic Radiated Power, transmission losses, the link power budget equation, system noise, carrier-to-noise ratio (C/N), the uplink, the downlink, effects of rain, combined uplink and downlink C/N ratio, inter modulation noise, inter satellite links. interference between satellite

**UNIT - IV SATELLITE ACCESS AND CODING METHODS****(9Hrs)**

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes

**UNIT - V SATELLITE APPLICATIONS****(9Hrs)**

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH). Recent trends - Macro and Nano Satellites

**Text Books**

- 1 Dennis Roddy, Satellite Communication, 4th Edition, Mc Graw Hill International, 2006.
- 2 Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd , 2017, ISBN: 978-81-265-0833-4
- 3 M.Richharia, Satellite Communication Systems-Design Principles, Macmillan 2003

**Reference Books**

1. Anil K. Maini, Varsha Agrawal, Satellite Communications, Wiley India Pvt. Ltd., 2015
2. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, Satellite Communication Systems Engineering, Prentice Hall/Pearson, 2007.
3. Tri T. Ha, Digital Satellite Communication, second edition, 2017.
4. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, Satellite Communication Systems Engineering, Prentice Hall/Pearson, 2007.
5. Gerard Maral, Michel Bousquet, Zhili Sun, Satellite Communications Systems: Systems, Techniques and Technology, 5th Edition, Wiley India Pvt. Ltd., 2020

**Web Resources**

1. <https://nptel.ac.in/courses/117/105/117105131/>
2. <https://www.managementstudyguide.com/satellite-communication-system.htm>
3. [https://www.tutorialspoint.com/satellite\\_communication/satellite\\_communication\\_introduction.htm](https://www.tutorialspoint.com/satellite_communication/satellite_communication_introduction.htm)
4. <https://www.intelsat.com/resources/tools/satellite-101/>
5. <https://www.sciencedirect.com/topics/engineering/satellite-communication-system>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	-	1	-	-	-	-	-	1	3	-	-
2	3	2	1	-	-	1	-	-	-	-	-	1	3	-	-
3	3	2	1	-	-	1	-	-	-	-	-	1	3	-	-
4	3	2	1	-	-	1	-	-	-	-	-	1	3	-	-
5	3	2	1	-	-	1	-	-	-	-	-	1	3	-	-

Correlation Level: 1-Low, 2-Medium, 3-High

U209ECE718	FUZZY LOGIC AND NEURAL NETWORK	L	T	P	C	Hrs
		3	0	0	3	45

### Course Objectives

- To study basic concept of fuzzy sets and fuzzy logic control
- To understand algorithm and basic rules in adaptive fuzzy logic
- To learn about basics of neural network concepts
- To understand mapping and recurrent networks
- To apply the concepts of fuzzy logic and neural networks

### Course Outcomes

After completion of the course, the students will be able to

CO1 – Describe the basic concept of fuzzy sets and fuzzy logic control (K1)

CO2 – Understand algorithm and basic rules in adaptive fuzzy logic (K2)

CO3 – Compute the multilayer perceptions of neural network concepts (K3)

CO4 – Understand the mapping and recurrent networks (K2)

CO5 – Apply fuzzy and neural logic for signal processing. (K3)

### UNIT - I FUZZY SET THEORY AND FUZZY LOGIC CONTROL (9 Hrs)

Basic concepts of fuzzy sets- Operations on fuzzy sets- Fuzzy relation equations- Fuzzy logic control Fuzzification –De-fuzzification- Knowledge base- Decision making logic- Membership functions – Rule base.

### UNIT - II ADAPTIVE FUZZY SYSTEMS (9 Hrs)

Performance index - Modification of rule base - Modification of membership functions - Simultaneous modification of rule base and membership functions- Genetic algorithms-Adaptive fuzzy system Neuro fuzzy systems.

### UNIT - III ARTIFICIAL NEURAL NETWORKS (9 Hrs)

Introduction- History of neural networks- multilayer perceptions- Back propagation algorithm and its Variants- Different types of learning, examples

### UNIT - IV MAPPING AND RECURRENT NETWORKS (9 Hrs)

Counter propagation –Self organization Map- Cognition and Neocognitron- Hopfield Net- Kohonen Nets- Grossberg Nets- ART-I, ART-II reinforcement learning

### UNIT - V APPLICATIONS (9 Hrs)

Application of fuzzy logic and neural networks to Measurement- Control- Adaptive Neural Controllers – Signal Processing and Image Processing

### Text Books

1. Vallum B.R And Hayagriva V.R, "C++, Neural networks and Fuzzy logic", BPB Publications, New Delhi, 2012
2. Chennakesava R. Alavala, "Fuzzy logic & Neural Networks", New Age International, 2014
3. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995

### Reference Books

1. Millon W. T, Sutton R.S and Werbos P. J, "Neural Networks for control", MIT Press 2007
2. Kosko, "Neural Networks and Fuzzy systems", Prentice hall of India Pvt. Ltd., New Delhi, 2015
3. J.M.Zurada, —Introduction to artificial neural systems—Jaico Publication house, Delhi 1994
4. J.Klin and T.A.Folger, —Fuzzy sets—University and information- Prentice Hall -1996
5. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2003



**Web Resources**

1. <https://nptel.ac.in/courses/117105084/>
2. <https://digitaldefynd.com/neural-networkscourses/>
3. <https://www.edx.org/learn/fuzzy-logic>
4. <https://nptel.ac.in/courses/108104049/16>
5. <https://www.coursera.org/projects/simulate-machine-intel-fuzzy-logic-google-sheets-bigml?>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	1	1	2	-	-	-	-	-	-	-	-	-	3	-	3
2	1	-	2	-	-	-	-	-	-	-	-	-	3	-	3
3	1	1	-	-	-	-	-	-	-	-	-	-	3	-	3
4	1	1	-	-	1	-	-	-	-	-	-	-	3	-	3
5	1	1	1	-	1	-	-	-	-	-	-	-	3	-	3

Correlation Level: 1-Low, 2-Medium, 3-High

U20ECE719

**BIOMEDICAL SIGNAL PROCESSING**

L	T	P	C	Hrs
3	0	0	3	45

**Course Objectives**

- To understand the basics of Biomedical Signal Processing
- To gain knowledge on the signal processing techniques used for ECG and EEG in cardio
- To gain knowledge on the signal processing techniques used for ECG and EEG in neuro
- To understand the wavelet concepts
- To understand the signal processing steps involved in Brain-Computer Interface.

**Course Outcomes**

*After completion of the course, the students will be able to*

**CO1** - Infer knowledge in basics of biomedical signal Processing (**K2**)

**CO2** - Make use of various Signal Processing techniques to identify ECG parameters (**K3**)

**CO3** - Select Various Signal Processing techniques for analysis of EEG (**K3**)

**CO4** - Apply wavelet analysis to identify different features of biological signals. (**K3**)

**CO5** - Understand the concept of Brain Computer Interface (**K2**)

**UNIT – I INTRODUCTION TO BIOSIGNAL PROCESSING****(9Hrs)**

The nature of biomedical signals, example of biomedical Signal, the action potential of a cardiac myocyte and neuron, objective of signal analysis and its difficulties. Sampling and Conversion requirements for biomedical signals, Time domain filtering - Synchronized averaging, Moving Average, Frequency Domain Filtering - Notch Filter

**UNIT - II CARDIOLOGICAL SIGNAL PROCESSING****(9Hrs)**

Basic electrocardiography, ECG lead systems, ECG signal characteristics, Analog filters, ECG amplifier and QRS detector - Differentiation-based and template-based rhythm analysis and Arrhythmia detection algorithms, automated ECG analysis. Data compression techniques: Turning Point algorithm, AZTEC, CORTES, and KL transform. Adaptive filters, Weiner filter principles, LMS & RLS.

**UNIT - III NEUROLOGICAL SIGNAL PROCESSING****(9Hrs)**

Stochastic process, linear prediction, Yule-Walker equations, Autoregressive Modeling of EEG signal. Detection of EEG Rhythms, Template matching for EEG spike-and-wave detection, detection of its complexes, Coherence analysis of EEG channels, Adaptive segmentation of EEG signals. Sleep stage analysis using Markov model, analysis of evoked potential using Prony's method.

**UNIT - IV WAVELETS IN MEDICINE****(9Hrs)**

Need for wavelets, types of wavelets, Selection of a wavelet for different applications, Statistical Analysis of Image difference by Decomposition and reconstruction of signals using wavelets, Wavelet denoising for various medical applications.

**UNIT - V BRAIN-COMPUTER INTERFACE****(9Hrs)**

Brain signals for BCIs, Neuronal activity in motor cortex, electric and magnetic fields produced by the brain, Signals reflecting brain metabolic activity, feature extraction and feature translation involved in BCIs - BCI hardware and software, its applications.

**Text Books**

1. Rangaraj M. Rangayyan, "Biomedical Signal Analysis:", second edition John Wiley & Sons, 2015
2. Willis J. Tompkins, "Biomedical Digital Signal Processing", Prentice-Hall of India Pvt. Ltd., 2012
3. Akram Aldroubi, Michael Unser, "Wavelets in Medicine and Biology", CRC Press, 1996.

**Reference Books**

1. Monson H.Hayes, "Statistical Digital Signal Processing and Modeling", Wiley-India, 2009.
2. Stephane Mallat, "Wavelet Tour of Signal Processing: The Sparse Way ", 3rd ed. Academic Press, 2009.
3. Jonathan Wolpaw and Elizabeth Winter Wolpaw, "Brain-Computer Interfaces: Principles and Practice", Oxford University Press, 2012.
4. Fabian J. Theis and Anke Meyer-Bäse, "Biomedical Signal Analysis - Contemporary Methods and Applications" MIT Press, March 2010
5. Johnny R Johnson, "Introduction to Digital Signal Processing Paperback," Prentice Hall India, January 1992

**Web Resources**

1. [https://www.youtube.com/watch?v=S\\_U-s27nPLE](https://www.youtube.com/watch?v=S_U-s27nPLE)
2. <https://www.youtube.com/watch?v=bFeYjFtSsrg>
3. <https://www.journals.elsevier.com/biomedical-signal-processing-and-control/recent-articles>
4. <https://www.classcentral.com/course/swayam-biomedical-signal-processing-10069>
5. <https://www.coursera.org/lecture/computational-neuroscience/3-1-neural-decoding-and-signal-detection-theory-67uWp>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	1	-	-	-	-	-	-	-	-	3	1	-
2	3	1	-	1	-	-	-	-	-	-	-	-	3	1	-
3	3	1	-	1	-	-	-	-	-	-	-	-	3	1	-
4	3	1	-	1	-	-	-	-	-	-	-	-	3	1	-
5	3	1	-	1	-	-	-	-	-	-	-	-	3	1	-

Correlation Level: 1-Low, 2-Medium, 3-High



U20ECE720

WIRELESS SENSOR NETWORK

L	T	P	C	Hrs
3	0	0	3	45

**Course Objectives**

- To obtain a broad idea of various challenges involved to design wireless sensor networks.
- To focus on network architecture and protocols of wireless sensor networks.
- To obtain a clear idea on wireless channel and communication fundamentals
- To Understand the different routing protocols
- To obtain a broad understanding of the technologies and applications for the emerging and exciting domain of wireless sensor networks.

**Course Outcomes**

*After completion of the course, the students will be able to*

- CO1 - Obtain the basic and advanced concepts knowledge in sensor networking architectures (K2)  
 CO2 - Obtain the basic idea on architecture and various parameters in sensor nodes (K2)  
 CO3 - Get an idea on MAC protocols for wireless sensor networks. (K2)  
 CO4 - Obtain an idea on routing protocols for wireless sensor networks. (K2)  
 CO5 - Be familiar with the existing and ongoing research in WSN on real time applications (K2)

**UNIT – I INTRODUCTION****(9 Hrs)**

Introduction – Challenges for wireless sensor networks, Characteristic requirements and required mechanisms- Comparison of Mobile ad hoc network and wireless sensor networks, Fieldbuses and wireless sensor networks - Enabling Technologies for Wireless Sensor Networks- Advantages of Sensor Networks- Applications of WSN

**UNIT - II ARCHITECTURES****(9 Hrs)**

Single node architecture- Hardware components, Energy consumption of sensor nodes, Operating systems and execution environment- Case study of Tiny OS and nesC- Examples of Sensor nodes. Network architecture-

**UNIT - III WIRELESS CHANNEL CONCEPTS AND PROTOCOLS****(9 Hrs)**

Wireless channel and communication fundamentals- Frequency allocation, Modulation and demodulation, Wave propagation effects and noise, Channel models- Physical layer and transceiver design considerations in WSNs- Fundamentals of (wireless) MAC protocols- Low duty cycle protocols and wakeup concepts- Contention-based protocols- Schedule-based protocols- IEEE 802.15.4 MAC protocol

**UNIT - IV ROUTING PROTOCOLS****(9 Hrs)**

Gossiping and agent-based unicast forwarding- Multipath unicast routing- Energy-efficient unicast- Broadcast and multicast, Source-based tree protocols, Shared core-based tree protocols, Mesh-based protocols- Geographic routing.

**UNIT - V APPLICATIONS OF WIRELESS SENSOR NETWORKS****(9 Hrs)**

WSN Applications Home Control, Building Automation, Industrial Automation, Medical Applications, Sensor and Robots, Reconfigurable Sensor Networks, Highway Monitoring, Military Applications, Civil and Environmental Engineering Applications, Wildfire Instrumentation, Habitat Monitoring, Nanoscopic Sensor Applications.

**Textbooks**

1. Feng Zhao, Leonidas Guibas "Wireless Sensor Networks: An Information Processing Approach" Elsevier 2007.
2. Holger Karl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005
3. Kazem Sohraby, Daniel Minoli, Taieb Znati, "Wireless Sensor Networks-Technology", Protocols, And Applications, John Wiley, 2007.



**Reference Books**

1. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
2. Bhaskar Krishnamachari, "Networking Wireless Sensors", Cambridge Press, 2005.
3. Sitharama Iyengar S, Nandan Parmeshwaran, Balkrishnan N and Chuka D, "Fundamentals of Sensor Network Programming, Applications and Technology", John Wiley & Sons, 2011.
4. Fei Hu and Xiaojun Cao, "Wireless Sensor Networks Principles and Practice", CRC Press, 2010.
5. C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education 2008.

**Web Resources**

1. <https://nptel.ac.in/courses/106/105/106105160/>
2. [www.tfb.edu.mk/amarkoski/WSN/Kniga-w02](http://www.tfb.edu.mk/amarkoski/WSN/Kniga-w02)
3. <http://profsite.um.ac.ir/~hyaghmae/ACN/WSNbook.pdf>
4. [http://ceng.usc.edu/~bkrishna/research/talks/WSN\\_Tutorial\\_Krishnamachari\\_ICISIP05.pdf](http://ceng.usc.edu/~bkrishna/research/talks/WSN_Tutorial_Krishnamachari_ICISIP05.pdf)
5. <http://ijctjournal.org/Volume4/issue-8/IJCTT-V4I8P194.pdf>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	-	-	-	-	-	-	-	1	2	2	-
2	3	1	-	-	1	-	-	-	-	-	-	1	2	2	-
3	3	1	-	-	1	-	-	-	-	-	-	1	2	2	-
4	3	1	-	-	1	-	-	-	-	-	-	1	2	2	-
5	3	1	-	-	1	-	-	-	-	-	-	1	2	2	-

Correlation Level: 1-Low, 2-Medium, 3-High

Professional Elective – V ( Offered in Semester VIII)		
Sl. No.	Course Code	Course Title
1	U20ECE821	High Speed Electronics
2	U20ECE822	Machine Learning for Wireless Communication
3	U20ECE823	Virtual and Augmented Reality
4	U20ECE824	Adaptive Signal Processing
5	U20ECE825	Real Time Systems



Professional Elective – V (Offered in Semester VIII)		
Sl. No.	Course Code	Course Title
1	U20ECE826	VLSI for Wireless Communication
2	U20ECE827	5G Wireless Communication Systems
3	U20ECE828	Biomedical Electronics
4	U20ECE829	Advanced Digital Image Processing
5	U20ECE830	Hardware Software Co-design



U20ECE828

**BIOMEDICAL ELECTRONICS**

L	T	P	C	Hrs
3	0	0	3	45

**Course Objectives**

- To know about basic of biomedical signal and its characteristics
- To learn about various signal conditioning circuits used in biomedical field
- To gain knowledge about basic measuring instruments in biomedical
- To study about the various assist devices used in the hospitals
- To understand recent trends in medical electronics

**Course Outcomes**

*After completion of the course, the students will be able to*

**CO1** –Acquire the knowledge of basic of biomedical signal and various medical electrodes (**K2**)

**CO2** – Gain the knowledge about various biomedical signal conditioning circuits (**K3**)

**CO3** – Understand the working mechanism of basic bio signal measuring electronics instruments (**K3**)

**CO4** – Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and Ventilators (**K3**)

**CO5** - Know about recent trends in medical electronics (**K2**)

**UNT-I FUNDAMENTALS OF BIOMEDICAL ELECTRONICS****(9 Hrs)**

Sources of biomedical signals, Generalized medical instrumentation block diagram, Origin of bio potentials - characteristics – Frequency and amplitude ranges , Bio-potential electrodes, Types of electrodes - Surface; needle and micro electrodes, Medical electrode - ECG system, EEG electrode system, EMG, EOG, ERG- typical waveforms and signal characteristics.

**UNIT-II BIO SIGNAL CONDITIONING CIRCUITS****(9 Hrs)**

Need for bio-amplifier – single ended bio-amplifier, differential bio-amplifier, Impedance matching circuit, isolation amplifiers – transformer and optical isolation – isolated DC amplifier and AC carrier amplifier., Power line interference, Right leg driven ECG amplifier, Band pass filtering.

**UNIT-III BASIC MEASURING ELECTRONICS INSTRUMENTS****(9 Hrs)**

Multimeters – analog and digital multimeters. Frequency and time measurement – analog CRO and digital storage oscilloscope. Medical display systems – single and multichannel displays, nonfade displays, LED and LCD displays.

**UNIT-IV ASSIST DEVICES****(9 Hrs)**

Blood pressure monitors – Electrocardioscope - Pulse Oximeter - pH meter - Auto analyzer – Pacemakers – Defibrillator - Heart lung machine - Nerve and muscle stimulators - Dialysis machines - Surgical diathermy equipments – Nebulizer; inhalator - Aspirator – Humidifier - Ventilator and spirometry.

**UNIT-V RECENT TRENDS IN MEDICAL ELECTRONICS****(9 Hrs)**

Digital radiography – CT - Basic Principle - Block diagram – Radioisotopes in medical diagnosis – Physics of radioactivity – Gamma Camera. Block diagram – SPECT Scanner – PET Scanner - Principles of NMR Imaging systems - Block diagram of NMR Imaging System – Ultrasonic Imaging Systems – Magnetic Resonance Imaging Systems.



**Text Books**

1. Leslie Cromwell, 'Biomedical Instrumentation and Measurement', Prentice Hall of India, New Delhi, **second edition, 2014**
2. R S Khandpur, "Handbook of Biomedical Instrumentation", 1st ed., Tata McGraw Hill Publishing Company Limited, **2014**
3. Erich A. Pfeiffer, Fred J Weibell and Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice-Hall of India Pvt.Ltd, 2011

**Reference Books**

1. Khandpur, R.Stata, "Handbook of Biomedical Instrumentation", McGraw-Hill, New Delhi, 3<sup>rd</sup> edition 2014
2. John G.Webster, 'Medical Instrumentation Application and Design', 4<sup>rd</sup> edition, Wiley India Edition, 2015
3. Joseph J.Carr and John M.Brown John, "Introduction to Biomedical Equipment Technology", Wiley and Sons, New York, 4<sup>th</sup> edition, 2001
4. Shakthi Chatterjee & Aubert Miller, "Biomedical Instrumentation", CENGAGE Learning, **2012.**
5. Chanderekha Goswami, "Handbook of Biomedical Instrumentation", Manglam Publications, 2010

**Web Resources**

1. [https://en.wikipedia.org/wiki/Biomedical\\_engineering](https://en.wikipedia.org/wiki/Biomedical_engineering)
2. <https://guides.lib.uh.edu/biomedical>
3. [https://www.google.co.in/books/edition/Handbook\\_of\\_Biomedical\\_Instrumentation](https://www.google.co.in/books/edition/Handbook_of_Biomedical_Instrumentation)
4. <https://nptel.ac.in/courses/108/108/108108180/>
5. <https://nptel.ac.in/courses/102/105/102105090/>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	-	-	-	-	1	-	-	1	1	-	1	3	-	-
2	3	1	2	1	2	2	-	1	1	1	-	1	3	2	1
3	3	1	1	1	1	2	-	1	1	1	-	1	3	-	-
4	3	1	1	1	1	3	-	1	1	1	-	1	3	2	-
5	3	1	2	1	2	3	2	1	1	1	-	1	3	2	1

Correlation Level: 1-Low, 2-Medium, 3-High

U20ECE829

**ADVANCED DIGITAL IMAGE  
PROCESSING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Hrs</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>45</b>

**Course Objectives**

- To gain knowledge about fundamentals of image processing.
- To understand the various image segmentation techniques.
- To extract features for image analysis.
- To introduce the concepts of image registration and image fusion.
- To illustrate 3D image visualization.

**Course Outcomes**

*After completion of the course, the students will be able to*

**CO1** - Explain the fundamentals of image processing **(K2)**

**CO2** - Learn and Analyze various image segmentation techniques **(K2)**

**CO3** - Understand extract features for image analysis. **(K2)**

**CO4** - Develop knowledge about the concepts of image registration and image fusion. **(K3)**

**CO5** - Identify 3D image visualization. **(K3)**

**UNIT - I FUNDAMENTALS OF DIGITAL IMAGE PROCESSING****(9 Hrs)**

Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, 2D image transforms-DFT, DCT, KLT, and SVD. Image enhancement in spatial and frequency domain, Review of morphological image processing

**UNIT - II SEGMENTATION****(9 Hrs)**

Edge detection, Thresholding, Region growing, Fuzzy clustering, Watershed algorithm, Active contour methods, Texture feature based segmentation, Model based segmentation, Atlas based segmentation, Wavelet based Segmentation methods.

**UNIT - III FEATURE EXTRACTION****(9 Hrs)**

First and second order edge detection operators, Phase congruency, Localized feature extraction detecting image curvature, shape features Hough transform, shape skeletonization, Boundary descriptors, Moments, Texture descriptors- Autocorrelation, Co-occurrence features, Run length features, Fractal model based features, Gabor filter, wavelet features.

**UNIT - IV MULTIMEDIA PROCESSING****(9 Hrs)**

Registration- Preprocessing, Feature selection-points, lines, regions and templates Feature correspondence-Point pattern matching, Line matching, and region matching Template matching .Transformation functions-Similarity transformation and Affine Transformation. Resampling Nearest Neighbor and Cubic Splines Image Fusion-Overview of image fusion, pixel fusion, Multiresolution based fusion discrete wavelet transform, Curvelet transform. Region based fusion.

**UNIT - V 3D IMAGE VISUALIZATION****(9 Hrs)**

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Surfaces, Multiply connected surfaces, Image processing in 3D, Measurements on 3D images.

**Text Books**

- 1 Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2015
- 2 Ardeshir Goshtasby, " 2D and 3D Image registration for Medical, Remote Sensing and Industrial Applications", John Wiley and Sons, 2005.
- 3 John C.Russ, "The Image Processing Handbook", CRC Press 7<sup>th</sup> edition, Taylor & Francis Inc , 2015

**Reference Books**

- 1 Mark Nixon, Alberto Aguado, "Feature Extraction and Image Processing", 2<sup>nd</sup> edition Academic Press, 2019.
- 2 R.C.Gonzalez and R.E. Woods, "Digital Image Processing ", 4<sup>th</sup> edition, Pearson, 2018
- 3 Rick S.Blum, Zheng Liu, "Multisensor image fusion and its Applications", Taylor& Francis, 2018.
4. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing, Analysis, and Machine Vision, Thomson Learning, 2013.
5. S Jayaraman, S Esakirajan and T Veerakumar, Digital Image Processing, McGraw Hill Education, 2009.

**Web Resources**

- 1 <http://eeweb.poly.edu/~onur/lectures/lectures.html>.
- 2 <http://www.caen.uiowa.edu/~dip/lecture/lecture.html>
- 3 <https://nptel.ac.in/courses/117105079/>
- 4 <https://nptel.ac.in/courses/108101113/>
- 5 <https://www.youtube.com/watch?v=GIL-h4IMgFk>

**COs/POs/PSOs Mapping**

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	1	2	-	-	-	-	-	-	-	-	-	3	-	1
2	3	1	2	-	-	-	-	-	-	-	-	-	3	-	1
3	3	1	2	-	-	-	-	-	-	-	-	-	3	-	1
4	3	1	2	-	-	-	-	-	-	-	-	-	3	-	1
5	3	1	2	-	-	-	-	-	-	-	-	-	3	-	1

Correlation Level: 1-Low, 2-Medium, 3-High

21





**SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)

Puducherry - 605 107

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**Professional Electives Opted in VI semester under Regulations – 2019**

Sl. No.	Course Code	Course Title	No. of Students
1	U19ECE62	Aircraft communication and Navigation Systems	71
2	U19ECE63	Nano Electronics and Devices	71
3	U19ECE65	Soft Computing	70

**Open Elective Courses Opted in VI semester under Regulations – 2019**

Sl. No.	Course Code	Course Title	Offering Department	No. of Students
1	U19ITO63	Essentials of Data Science	IT	70
2	U19ITO64	Mobile App Development	IT	71
3	U19ADO61	Principle of Artificial Intelligence and Machine Learning	AI&DS	71

**NPTEL Courses Opted in VI semester under Regulations – 2019**

Sl. No.	Course Title	Duration
1	Python for Data Science	4 weeks
2	Electronic Waste Management - Issues and Challenges	4 weeks
3	Electric Vehicles - Part 1	4 weeks
4	Design Thinking - A Primer	4 weeks
5	A brief introduction of Micro - Sensors	4 weeks
6	Awareness Programme on Solar Water Pumping System	4 weeks



# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)

Puducherry - 605 107

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**PROFESSIONAL ELECTIVE - III**

**Even Semester: 2021-22**

**Subject Name: Aircraft communication and Navigation Systems**

**Year/Semester: III / VI**

**Course Code: U19ECE62**

S.No	Reg. No.	Name of the Student	Section
1	19TC0051	Aakash.A	A
2	19TC0057	Akshaya S	A
3	19TC0077	Charulatha. M	A
4	19TC0078	Deepika. S	A
5	19TC0086	Easwarakumar. K	A
6	19TC0089	Fleming Roland. P	A
7	19TC0101	Harshavardhni. A	A
8	19TC0112	Jayavignesh S	A
9	19TC0115	Jeevan Sanjay. S	A
10	19TC0120	Kavin. S	A
11	19TC0121	Kaviya.M	A
12	19TC0143	Mohamed Faisal B	A
13	19TC0148	Nadaesh. D	A
14	19TC0149	Nandhidha. R	A
15	19TC0151	Narmadha. S	A
16	19TC0153	Nasser Hussain. J	A
17	19TC0157	Nivethitha. D	A
18	19TC0163	Prathela. T	A
19	19TC0168	Ragaventra.R	A
20	19TC0181	Sanjay N	A
21	19TC0192	Saumya.V	A
22	19TC0196	Shakila. T	A
23	19TC0202	Sivasankaran. M	A
24	19TC0215	Subhiksha. R	A
25	19TC0227	Suvetha. S	A
26	19TC0232	Thamizh Chemmal. S	A
27	19TC0238	Vaasan C	A
28	19TC0239	Vanmuhil.B	A
29	19TC0243	Venkattheeban.V	A
30	19TC0251	Yogesh Krushna. R	A
31	19TC0054	Aishwin. M	B

S.No	Reg. No.	Name of the Student	Section
32	19TC0065	Arivoomathi. P	B
33	19TC0066	Arunkumar.N	B
34	19TC0085	Divyabharathi U	B
35	19TC0090	Gayathri. S	B
36	19TC0092	Gogulakrishnan.P	B
37	19TC0103	Hemamalini S	B
38	19TC0106	Humaira. C	B
39	19TC0131	Logeshprassanna.R	B
40	19TC0132	Lokkeswaran.P	B
41	19TC0140	Maria Jenifer E	B
42	19TC0142	Michael Antony .M	B
43	19TC0144	Mohanprasath. R	B
44	19TC0150	Nandhini. P	B
45	19TC0159	Piradeep.R	B
46	19TC0166	Premalatha. S	B
47	19TC0167	Priyadharshini V	B
48	19TC0169	Raghul A	B
49	19TC0171	Rajesh.J	B
50	19TC0214	Subathra. V	B
51	19TC0224	Surjiith. S	B
52	19TC0235	Thirukumaran. M	B
53	19TC0240	Vasunthra. A	B
54	19TC0242	Venisri T	B
55	19TC0062	Anandavel .V	C
56	19TC0068	Aswin.Z	C
57	19TC0104	Hera.V	C
58	19TC0116	Kailash.V	C
59	19TC0147	Nachellai.I	C
60	19TC0165	Pravin Kumaar.C	C
61	19TC0170	Ragnal Kevin Jerome. A	C
62	19TC0184	Santhiya.V	C
63	19TC0195	Sermalakshmi.P	C
64	19TC0200	Sivanesan.B	C
65	19TC0203	Snega .R	C
66	19TC0219	Sundar Ganesh .N	C
67	19TC0223	Surender. V	C
68	19TC0231	Swetha.R	C
69	19TC0245	Vigneshwarar.V	C
70	19TC0246	Vijay.B	C
71	19TC0254	Yuvalatchumi.S	C





# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)

Puducherry - 605 107

## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING** **Professional Elective - III**

Even Semester: 2021-22

Subject Name: Nano Electronics and Devices

Year/Semester: III / VI

Course Code: U19ECE63

S.No	Reg. No.	Name of the Student	Section
1	19TC0055	Ajay Ganesh. J	A
2	19TC0064	Anusree Manoj	A
3	19TC0069	Aswin. S	A
4	19TC0081	Dhanush Jawahar Magee .M	A
5	19TC0084	Dhevipriyanka. S	A
6	19TC0088	Eswara Pandian. S	A
7	19TC0091	Gayathry R	A
8	19TC0097	Goventhan. M	A
9	19TC0108	Ishwar. V	A
10	19TC0113	Jayapreethi K	A
11	19TC0114	Jeevabharathi. T	A
12	19TC0118	Kaniya Kayathri V	A
13	19TC0128	Krishna Priya.K	A
14	19TC0133	Madhumitha M	A
15	19TC0152	Naresh Kumar. M	A
16	19TC0154	Naveen Chander. P	A
17	19TC0160	Pradikksha. S	A
18	19TC0173	Rajeshvaran N	A
19	19TC0177	Riyaz Ahamad. S	A
20	19TC0182	Sankavi.S	A
21	19TC0186	Saran.A	A
22	19TC0193	Sedhuraman. S	A
23	19TC0204	Sneha.K	A
24	19TC0225	Surya Raja. S	A
25	19TC0237	Thiruvikraman.V	A
26	19TA0031	Vijay.R	B
27	19TC0073	Balavinayaga. S	B
28	19TC0093	Gokul Krishnan. S	B
29	19TC0095	Gokulakrishnan. K.S.	B
30	19TC0111	Janani. M	B
31	19TC0122	Keerthivasan.V	B



S.No	Reg. No.	Name of the Student	Section
32	19TC0124	Kirithiga. V	B
33	19TC0126	Kiruthivaas.E	B
34	19TC0136	Manikandan. D	B
35	19TC0156	Naveen. M	B
36	19TC0162	Prasannavasan. V	B
37	19TC0176	Ranjith. S	B
38	19TC0194	Seran. P	B
39	19TC0199	Shurekha. S	B
40	19TC0220	Sunnivas. K	B
41	19TC0229	Swedha. J	B
42	19TC0244	Vigneshvar. V	B
43	19TC0247	Vijayalakshmy .R	B
44	19TC0252	Yogi Ram Kumar. M.S.	B
45	19TCL001	Aravind.G	B
46	19TC0056	Ajaydev.C.R	C
47	19TC0059	Alagamma.V	C
48	19TC0074	Balla Veera Venkata Durga Prasad	C
49	19TC0099	Harikaran. U	C
50	19TC0109	Jagadeesan.A	C
51	19TC0127	Krishnan.G	C
52	19TC0129	Kugan A	C
53	19TC0135	Manibharathi.R	C
54	19TC0141	Meharaj. C	C
55	19TC0155	Naveen .P	C
56	19TC0158	Pampana Venkata Nikhil	C
57	19TC0172	Rajesh.P	C
58	19TC0179	Sandhiya V	C
59	19TC0189	Saritha.G	C
60	19TC0197	Sharmila .M	C
61	19TC0201	Sivaraj .T	C
62	19TC0205	Somnath. S	C
63	19TC0210	Srinivas. V	C
64	19TC0213	Stephen Jebakumar.S	C
65	19TC0217	Sudhakar.S	C
66	19TC0222	Suraj.V	C
67	19TC0226	Suryakumar.S	C
68	19TC0236	Thirumurugan.T	C
69	19TC0241	Velmurugan.P	C
70	19TC0250	Yamini Krishna.G	C
71	19TCL003	Kaviyarasan. S	C



# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)

Puducherry - 605 107

## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING** **Professional Elective - III**

**Even Semester: 2021-22**  
**Subject Name: Soft Computing**

**Year/Semester: III / VI**  
**Course Code: U19ECE65**

S.No	Reg. No.	Name of the Student	Section
1	19TC0060	Alex Xavier	A
2	19TC0070	Azeess Basha G	A
3	19TC0072	Balamurugan. V	A
4	19TC0079	Devavasanth R	A
5	19TC0087	Erick Jeffery.N	A
6	19TC0094	Gokul. A	A
7	19TC0137	Manivannan. P	A
8	19TC0146	Muthukumaran. A	A
9	19TC0180	Sanjay. C	A
10	19TC0208	Sowmmiya. E	A
11	19TC0211	Sri Ram. R	A
12	19TC0212	Srivatsan G	A
13	19TC0233	Thanush. M	A
14	19TC0234	Thatchitha. K	A
15	19TCL004	Prasanth.K.N	A
16	19TCL005	Saranraj.M	A
17	19TC0058	Akshaya. I	B
18	19TC0061	Anandkumar C	B
19	19TC0063	Anantapadmanaban R	B
20	19TC0067	Arunprasanth S	B
21	19TC0075	Bangayar Selvi.N.G	B
22	19TC0082	Dharani. A	B
23	19TC0100	Harini. K	B
24	19TC0105	Hiran Lal. A	B
25	19TC0107	Indhuja. M	B
26	19TC0117	Kamalraj.A	B
27	19TC0119	Karthikcharan. D	B
28	19TC0125	Kirthana. A	B
29	19TC0138	Manju S	B
30	19TC0145	Muhammad Aadhil.M	B
31	19TC0174	Ramanathan. M	B

S.No	Reg. No.	Name of the Student	Section
32	19TC0185	Sarah. S	B
33	19TC0187	Sarath Chandiran S	B
34	19TC0188	Sargunal A	B
35	19TC0191	Sathya Moorthy. J	B
36	19TC0206	Soundarya S	B
37	19TC0207	Sowmiya M	B
38	19TC0209	Srikkaanth. D	B
39	19TC0218	Sumanth. G.V.	B
40	19TC0228	Suvetha Ve	B
41	19TE0116	Nivetha.S	B
42	19TI0007	Gautham Venkatesh	B
43	19TC0052	Agarvin.B	C
44	19TC0053	Aishwarya.L.S	C
45	19TC0071	Balabharathi.V	C
46	19TC0076	Chandranath.G	C
47	19TC0080	Dhanraj. S	C
48	19TC0083	Dharanidar.S	C
49	19TC0096	Gopinath.M	C
50	19TC0098	Hari Krishnan.V	C
51	19TC0102	Hemabala. R	C
52	19TC0110	Janaki.S	C
53	19TC0123	Kesavavarathan.K	C
54	19TC0130	Logesh.R	C
55	19TC0134	Maithili .S	C
56	19TC0139	Manoj Lara.C	C
57	19TC0161	Prakash.V	C
58	19TC0164	Praveena. P	C
59	19TC0175	Ramya .T	C
60	19TC0178	Roshan Solomon .A	C
61	19TC0183	Santhiya. S	C
62	19TC0190	Sashanka Naga Sai Sunkara	C
63	19TC0198	Shrutii. E	C
64	19TC0216	Subiksha S	C
65	19TC0230	Swetha.A	C
66	19TC0248	Vineeth.R	C
67	19TC0249	Vishwaa. M	C
68	19TC0253	Yokesh.S	C
69	19TCL002	Elangkavi.K	C
70	19TCL006	Saravanan.P	C





# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)

Puducherry - 605 107

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Open Elective - III

Even Semester: 2021-22

Subject Name: Essentials of Data Science

Year/Semester: III / VI

Course Code: U19ITO63

S.No	Reg. No.	Name of the Student	Section
1	19TC0055	Ajay Ganesh. J	A
2	19TC0060	Alex Xavier	A
3	19TC0081	Dhanush Jawahar Magee .M	A
4	19TC0084	Dhevipriyanka. S	A
5	19TC0091	Gayathry R	A
6	19TC0094	Gokul. A	A
7	19TC0101	Harshavardhni. A	A
8	19TC0108	Ishwar. V	A
9	19TC0113	Jayapreethi K	A
10	19TC0114	Jeevabharathi. T	A
11	19TC0118	Kaniya Kayathri V	A
12	19TC0128	Krishna Priya.K	A
13	19TC0146	Muthukumaran. A	A
14	19TC0152	Naresh Kumar. M	A
15	19TC0160	Pradikksha. S	A
16	19TC0173	Rajeshvaran N	A
17	19TC0177	Riyaz Ahamad. S	A
18	19TC0180	Sanjay. C	A
19	19TC0182	Sankavi.S	A
20	19TC0186	Saran.A	A
21	19TC0193	Sedhuraman. S	A
22	19TC0204	Sneha.K	A
23	19TC0237	Thiruvikraman.V	A
24	19TC0073	Balavinayaga. S	B
25	19TC0093	Gokul Krishnan. S	B
26	19TC0095	Gokulakrishnan. K.S.	B
27	19TC0111	Janani. M	B
28	19TC0122	Keerthivasan.V	B
29	19TC0124	Kirithiga. V	B



S.No	Reg. No.	Name of the Student	Section
30	19TC0126	Kiruthivaas.E	B
31	19TC0132	Lokkeswaran.P	B
32	19TC0144	Mohanprasath. R	B
33	19TC0156	Naveen. M	B
34	19TC0174	Ramanathan. M	B
35	19TC0187	Sarath Chandiran S	B
36	19TC0199	Shurekha. S	B
37	19TC0209	Srikkaanth. D	B
38	19TC0218	Sumanth. G.V.	B
39	19TC0220	Sunnivas. K	B
40	19TC0229	Swedha. J	B
41	19TC0244	Vigneshvar. V	B
42	19TC0247	Vijayalakshmy .R	B
43	19TC0252	Yogi Ram Kumar. M.S.	B
44	19TCL001	Aravind.G	B
45	19TC0059	Alagamma.V	C
46	19TC0071	Balabharathi.V	C
47	19TC0074	Balla Veera Venkata Durga Prasad	C
48	19TC0083	Dharanidar.S	C
49	19TC0099	Harikaran. U	C
50	19TC0109	Jagadeesan.A	C
51	19TC0123	Kesavavarathan.K	C
52	19TC0127	Krishnan.G	C
53	19TC0129	Kugan A	C
54	19TC0139	Manoj Lara.C	C
55	19TC0155	Naveen .P	C
56	19TC0158	Pampana Venkata Nikhil	C
57	19TC0170	Ragnal Kevin Jerome. A	C
58	19TC0172	Rajesh.P	C
59	19TC0179	Sandhiya V	C
60	19TC0189	Saritha.G	C
61	19TC0197	Sharmila .M	C
62	19TC0201	Sivaraj .T	C
63	19TC0205	Somnath. S	C
64	19TC0210	Srinivas. V	C
65	19TC0213	Stephen Jebakumar.S	C
66	19TC0219	Sundar Ganesh .N	C
67	19TC0226	Suryakumar.S	C
68	19TC0230	Swetha.A	C
69	19TC0236	Thirumurugan.T	C
70	19TC0250	Yamini Krishna.G	C



# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)  
Puducherry - 605 107

## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

### **Open Elective - III**

Even Semester: 2021-22

Subject Name: Mobile App Development

Year/Semester: III / VI

Course Code: U19ITO64

S.No	Reg. No.	Name of the Student	Section
1	19TC0051	Aakash.A	A
2	19TC0069	Aswin. S	A
3	19TC0086	Easwarakumar. K	A
4	19TC0089	Fleming Roland. P	A
5	19TC0112	Jayavignesh S	A
6	19TC0115	Jeevan Sanjay. S	A
7	19TC0120	Kavin. S	A
8	19TC0121	Kaviya.M	A
9	19TC0148	Nadaesh. D	A
10	19TC0151	Narmadha. S	A
11	19TC0153	Nasser Hussain. J	A
12	19TC0157	Nivethitha. D	A
13	19TC0168	Ragaventra.R	A
14	19TC0181	Sanjay N	A
15	19TC0192	Saumya.V	A
16	19TC0196	Shakila. T	A
17	19TC0208	Sowmmiya. E	A
18	19TC0225	Surya Raja. S	A
19	19TC0227	Suvetha. S	A
20	19TC0238	Vaasan C	A
21	19TC0239	Vanmuhil.B	A
22	19TC0243	Venkattheeban.V	A
23	19TC0251	Yogesh Krushna. R	A
24	19TC0054	Aishwin. M	B
25	19TC0058	Akshaya. I	B
26	19TC0061	Anandkumar C	B
27	19TC0082	Dharani. A	B
28	19TC0092	Gogulakrishnan.P	B
29	19TC0103	Hemamalini S	B
30	19TC0105	Hiran Lal. A	B
31	19TC0107	Indhuja. M	B



S.No	Reg. No.	Name of the Student	Section
32	19TC0117	Kamalraj.A	B
33	19TC0119	Karthikcharan. D	B
34	19TC0131	Logeshprassanna.R	B
35	19TC0162	Prasannavasan. V	B
36	19TC0169	Raghul A	B
37	19TC0171	Rajesh.J	B
38	19TC0185	Sarah. S	B
39	19TC0188	Sargunal A	B
40	19TC0224	Surjiith. S	B
41	19TC0235	Thirukumaran. M	B
42	19TC0242	Venisri T	B
43	19TI0007	Gautham Venkatesh	B
44	19TC0053	Aishwarya.L.S	C
45	19TC0062	Anandavel .V	C
46	19TC0076	Chandranath.G	C
47	19TC0096	Gopinath.M	C
48	19TC0098	Hari Krishnan.V	C
49	19TC0102	Hemabala. R	C
50	19TC0110	Janaki.S	C
51	19TC0116	Kailash.V	C
52	19TC0130	Logesh.R	C
53	19TC0134	Maithili .S	C
54	19TC0147	Nachellai.I	C
55	19TC0161	Prakash.V	C
56	19TC0164	Praveena. P	C
57	19TC0165	Pravin Kumaar.C	C
58	19TC0183	Santhiya. S	C
59	19TC0184	Santhiya.V	C
60	19TC0195	Sermalakshmi.P	C
61	19TC0200	Sivanesan.B	C
62	19TC0203	Snega .R	C
63	19TC0216	Subiksha S	C
64	19TC0217	Sudhakar.S	C
65	19TC0222	Suraj.V	C
66	19TC0223	Surender. V	C
67	19TC0241	Velmurugan.P	C
68	19TC0245	Vigneshwarar.V	C
69	19TC0249	Vishwaa. M	C
70	19TC0253	Yokesh.S	C
71	19TCL003	Kaviyarasan. S	C





# **SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE**

(An Autonomous Institution)

Puducherry - 605 107

## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

### **Open Elective - III**

Even Semester: 2021-22

Year/Semester: III / VI

Subject Name: Principle of Artificial Intelligence and Machine Learning Course Code: U19ADO61

S.No	Reg. No.	Name of the Student	Section
1	19TC0057	Akshaya S	A
2	19TC0064	Anusree Manoj	A
3	19TC0070	Azeess Basha G	A
4	19TC0072	Balamurugan. V	A
5	19TC0077	Charulatha. M	A
6	19TC0078	Deepika. S	A
7	19TC0079	Devavasanth R	A
8	19TC0087	Erick Jeffery.N	A
9	19TC0088	Eswara Pandian. S	A
10	19TC0097	Goventhan. M	A
11	19TC0133	Madhumitha M	A
12	19TC0137	Manivannan. P	A
13	19TC0143	Mohamed Faisal B	A
14	19TC0149	Nandhidha. R	A
15	19TC0154	Naveen Chander. P	A
16	19TC0163	Prathela. T	A
17	19TC0202	Sivasankaran. M	A
18	19TC0211	Sri Ram. R	A
19	19TC0212	Srivatsan G	A
20	19TC0215	Subhiksha. R	A
21	19TC0232	Thamizh Chemmal. S	A
22	19TC0233	Thanush. M	A
23	19TC0234	Thatchitha. K	A
24	19TCL004	Prasanth.K.N	A
25	19TCL005	Saranraj.M	A
26	19TA0031	Vijay.R	B
27	19TC0063	Anantapadmanaban R	B
28	19TC0065	Arivoomathi. P	B
29	19TC0066	Arunkumar.N	B
30	19TC0067	Arunprasanth S	B
31	19TC0075	Bangayar Selvi.N.G	B
32	19TC0085	Divyabharathi U	B



S.No	Reg. No.	Name of the Student	Section
33	19TC0090	Gayathri. S	B
34	19TC0100	Harini. K	B
35	19TC0106	Humaira. C	B
36	19TC0125	Kirthana. A	B
37	19TC0136	Manikandan. D	B
38	19TC0138	Manju S	B
39	19TC0140	Maria Jenifer E	B
40	19TC0142	Michael Antony .M	B
41	19TC0145	Muhammad Aadhil.M	B
42	19TC0150	Nandhini. P	B
43	19TC0159	Piradeep.R	B
44	19TC0166	Premalatha. S	B
45	19TC0167	Priyadharshini V	B
46	19TC0176	Ranjith. S	B
47	19TC0191	Sathya Moorthy. J	B
48	19TC0194	Seran. P	B
49	19TC0206	Soundarya S	B
50	19TC0207	Sowmiya M	B
51	19TC0214	Subathra. V	B
52	19TC0228	Suvetha Ve	B
53	19TC0240	Vasunthra. A	B
54	19TE0116	Nivetha.S	B
55	19TC0052	Agarvin.B	C
56	19TC0056	Ajaydev.C.R	C
57	19TC0068	Aswin.Z	C
58	19TC0080	Dhanraj. S	C
59	19TC0104	Hera.V	C
60	19TC0135	Manibharathi.R	C
61	19TC0141	Meharaj. C	C
62	19TC0175	Ramya .T	C
63	19TC0178	Roshan Solomon .A	C
64	19TC0190	Sashanka Naga Sai Sunkara	C
65	19TC0198	Shrutii. E	C
66	19TC0231	Swetha.R	C
67	19TC0246	Vijay.B	C
68	19TC0248	Vineeth.R	C
69	19TC0254	Yuvalatchumi.S	C
70	19TCL002	Elangkavi.K	C
71	19TCL006	Saravanan.P	C





**SRI MANAKULA VINAYAGAR  
ENGINEERING COLLEGE**

(An Autonomous Institution)  
Puducherry - 605 107

**Department of Electronics and Communication Engineering**

---

**Minutes of 4th BoS Meeting**

---

for M.Tech – Electronics and Communication Engineering  
M.Tech – VLSI and Embedded Systems  
Ph.D – Electronics and Communication Engineering

**Venue:** Seminar Hall, Department of ECE  
Sri Manakula Vinayagar Engineering College  
Madagadipet, Puducherry – 605 107

**Date & Time:** 26<sup>th</sup> February 2022 & 12.30 pm

### Minutes of 4<sup>th</sup> Board of Studies Meeting

The Fourth Board of Studies meeting for PG and Research programmes was held on 26<sup>th</sup> February 2022 at 10:30 am in the Seminar Hall, Department of ECE, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting in the venue

Sl. No	Name of the Member	Designation
1	<b>Dr. P. Raja</b> Professor and Head, Department of ECE	Chairman
2	<b>Mr. C. Gnanavel</b> General Manager, Production and Technology, Lenovo India Ltd., Puducherry	Industry Member
3	<b>Dr.V.Bharathi</b> , Professor / ECE <b>Specialization:</b> Wireless Communication	Member
4	<b>Dr.R.Ramya</b> , Professor/ ECE <b>Specialization:</b> ECE	Member
5	<b>Dr. J.Pradeep</b> , Associate Professor / ECE <b>Specialization:</b> Image Processing	Member
6	<b>Dr. R.Kurinjimalar</b> , Associate Professor / ECE <b>Specialization:</b> Mobile Satellite Communication	Member
7	<b>Dr. N.Jothy</b> , Associate Professor / ECE <b>Specialization:</b> Wireless Communication	Member
8	<b>Prof. R. Ilaiyaraja</b> , Assistant Professor / ECE <b>Specialization:</b> VLSI Design	Member
9	<b>Prof.Egalite Francis</b> , Assistant Professor <b>Specialization:</b> Mathematics	Member
10	<b>Prof. K. Oudayakumar</b> , Associate Professor <b>Specialization:</b> Physics	Member
11	<b>Dr. S. Deepa</b> , Professor <b>Specialization:</b> Chemistry	Member
12	<b>Dr.D.Jaichithra</b> , Associate Professor <b>Specialization:</b> English	Member
13	<b>Mr. Dharanidharan. G</b> Associated Functional Consultant, Birlasoft Limited, Old Mahabalipuram Road, Chennai – 600096	Alumni Member



The following members were present in the online platform

Sl. No	Name of the Member	Designation
1	<b>Dr. Gerardine Immaculate Mary</b> Professor, Department of Embedded Systems, Vellore Institute of Technology (VIT), Vellore, Tamil Nadu, India	Expert Member (University Nominee)
2	<b>Dr. N. Venkateswaran</b> Professor, Department of ECE, SSN - College of Engineering, Kalavakkam, Tamil Nadu, India	Expert Member (Academic Council Nominee)
3	<b>Dr. V. R. Vijayakumar</b> Associate Professor & Head, Department of ECE, Anna University, Regional Campus, Coimbatore	Expert Member (Academic Council Nominee)

### AGENDA OF THE MEETING

#### BoS /2022/ PG / ECE 4.1

To review and confirm the minutes of third BoS meeting held on 28<sup>th</sup> August 2021

#### BoS/2022 / PG / ECE 4.2

To consider and approve the additional certification courses for PG programmes from the Academic Year 2021-22 onwards

#### BoS / 2022 / PG / ECE 4.3

To consider and approve the admission process introduced in research program (Ph.D- Electronics and Communication Engineering)

#### BoS / 2022/ PG / ECE 4.4

Any other item with the permission of chair

### MINUTES OF THE MEETING

Dr. P. Raja, Chairman, BoS opened the meeting with warm welcome and thanked all the Members for accepting the third BoS meeting Invitation for the M.Tech and Research programmes. The Chairman proceeded the meeting subsequently and discussed the agenda items.

#### BoS / 2022/ PG / ECE 4.1

##### To review and confirm the Third BoS meeting minutes held on 28.08.2021

The Third BoS Meeting for M.Tech.- Electronics and Communication Engineering and M. Tech – VLSI and Embedded Systems under Regulations 2020 held on 28-08-2021. The members have reviewed the minutes of the meeting and approved.

**Minutes are Reviewed and Confirmed**

**To consider and approve the additional certification courses included for PG programmes from the Academic Year 2021-22 onwards**

Students shall choose a national or international certification course of 40 - 50 hours of duration specified in the curriculum, which will be offered through the Centre of Excellence. Based on the recommendation of BoS members, the number of certification courses to be offered under regulations 2020 has been increased to 36 courses from the academic year 2021-22.

List of certification courses introduced from the academic year 2021-22

Course Code	Course Title
P20ECCX01	Video & Image processing Development System
P20ECCX02	Android Programming
P20ECCX03	Artificial Intelligence And Edge Computing
P20ECCX04	CCNA (Routing And Switching)
P20ECCX05	CCNA (Wireless)
P20ECCX06	Cloud Computing
P20ECCX07	Cyber Security
P20ECCX08	Data Science
P20ECCX09	Data Science and Data Analytics
P20ECCX10	Data Science Using R
P20ECCX11	Bio signal and Image processing development system
P20ECCX12	Google Analytics
P20ECCX13	Google Cloud
P20ECCX14	Industry 4.0
P20ECCX15	Internet of Things
P20ECCX16	IoT using Python
P20ECCX17	Java Programming
P20ECCX18	Android Medical app development
P20ECCX19	Machine Learning and Deep Learning
P20ECCX20	Web Programming ( HTML, CSS, JAVA Script)
P20ECCX21	Advanced Java Programming
P20ECCX22	Advanced Python Programming
P20ECCX23	Android Medical app development
P20ECCX24	Artificial Intelligence and Edge Computing
P20ECCX25	Embedded System Using Arduino
P20ECCX26	Embedded System Using C
P20ECCX27	Embedded System With IoT
P20ECCX28	Introduction to C Programming



P20ECCX29	Introduction to C++ Programming
P20ECCX30	Mobile Edge Computing
P20ECCX31	Python Programming
P20ECCX32	Web Programming -I
P20ECCX33	Web Programming-II
P20ECCX34	VLSI Design
P20ECCX35	PLC

**Noted and Approved**

**BoS / 2022/ PG / ECE 4.3**

**To consider and approve the admission process introduced in research program (Ph.D- Electronics and Communication Engineering)**

- As per the members' recommendation in third BOS, a separate entrance examination for PhD admission has been conducted as per the UGC norms and Pondicherry University norms on December 19, 2021 under regulations 2021.
- The members appreciated the 17 applications received for the Ph.D. program. Only 15 students appeared in the entrance examination, and 11 candidates were qualified for personal interview.
- An interview date is planned to be conducted in the month of March 2022.
- The members appreciated the progress of the PhD programme.

**Noted and approved**

**BoS / 2022/ PG / ECE 4.4**

**Any other item with the permission of chair**

- Members are appreciated the syllabus and curriculum for PG students.
- Members are suggested to increase more number of PG students

Dr. P. Raja, Chairman – BoS and Head of Department, Electronics and Communication Engineering, concluded the meeting at 2.00 pm with vote of thanks.



**Dr. P. RAJA**

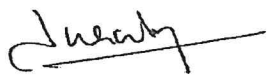
Board Chairman - ECE



**Dr. GERARDINE IMMACULATE MARY**

Professor, Department of Embedded Systems,  
Vellore Institute of Technology (VIT), Vellore  
(Expert Member - University Nominee)

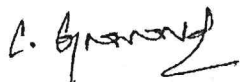
Department of ECE – Fourth BoS Meeting (PG and Research Programs)




**Dr. N. VENKATESWARAN**  
Professor, Department of ECE,  
SSN College of Engineering, Kalavakkam  
(Expert Member – AC Nominee)



**Dr. V. R. VIJAYAKUMAR**  
Associate Professor & Head, Department of  
ECE, Anna University, Regional Campus,  
Coimbatore  
(Expert Member – AC Nominee)




**Mr. C. GNANAVEL**  
Manager, Production and Technology,  
Lenovo India Ltd., Puducherry  
(Industry Member)



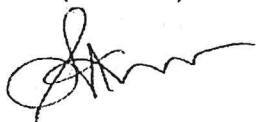
**Mr. DHARANIDHARAN. G**  
Associated Functional Consultant,  
Birlasoft Limited, Chennai  
(Alumni Member)



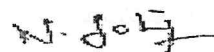
**Dr. V. BHARATHI**  
Professor / ECE  
(Member)



**Dr. R. RAMYA**  
Professor/ ECE  
(Member)



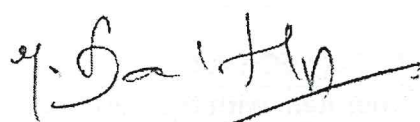
**Dr. R. KURINJIMALAR**  
Associate Professor / ECE  
(Member)



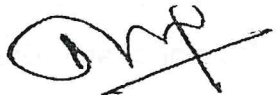
**Dr. N. Jothy**  
Associate Professor / ECE  
(Member)



**Dr. J. PRADEEP**  
Associate Professor / ECE  
(Member)



**Prof. EGALITE FRANCIS**  
Assistant Professor / Mathematics  
(Member)



**Prof. R. ILAIYARAJA,**  
Assistant Professor / ECE  
(Member)



**Prof. K. OUDAYAKUMAR,**  
Associate Professor / Physics  
(Member)



**Dr. D. JAICHITHRA**  
Associate Professor  
(Member)



**Dr. S. DEEPA**  
Professor / Chemistry  
(Member)