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

3rd - Board of Studies Meeting
in the Department of
Computer and Communication Engineering

for the Programme
B.Tech – Computer and Communication Engineering

Venue
Seminar Hall, Department of CCE
Sri ManakulaVinayagar Engineering College
Madagadipet, Puducherry – 605 107

Date & Time
28.08.2021& 10.30 am

MINUTES OF BOARD OF STUDIES

The Third Board of Studies meeting for B.Tech. Computer and Communication Engineering was held on 28th August 2021 at 10:30 A.M in the Seminar Hall, Department of CCE, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS
1	**Dr. V.Bharathi** Professor and Head, Department of CCE	Chairman
2	**Dr. G. Nagarajan** Professor, Department of ECE Pondicherry Engineering College, Puducherry	Member
3	**Dr. G. Lakshmi Sutha**Professor & Head, Department of ECE, National Institute of Technology, Karaikal	Member
4	**Dr. T. T. Mirnalinee,** Professor, Department of Computer Science and Engineering, SSN College ofEngineering, Chennai	Member
5	**Porseezhian Arumugugam** Senior Engineering Manager Capgemini Engineering, Bengaluru	Member

6	**Dr. S. Premkumar** Associate Professor/ECE Sri Manakula Vinayagar Engineering College	Member
7	**Ms. V.Logisvary** Assistant Professor /ECE Sri Manakula Vinayagar Engineering College	Member
8	**Ms. M.Julie Therese** Assistant Professor/ECE Sri Manakula Vinayagar Engineering College	Member
9	**Mr. C. Srithar** Assistant Professor/ECE Sri Manakula Vinayagar Engineering College	Member
10	**Arokiaraj Christian St.Hubert** Assistant Professor /CSE Sri Manakula Vinayagar Engineering College	Member
11	**Mrs.G.Namitha** Assistant Professor /English Sri Manakula Vinayagar Engineering College	Member
12	**Mrs. S.Geetha** Assistant Professor /physics Sri Manakula Vinayagar Engineering College	Member
13	**Dr. S. Savithri** Assistant Professor /Chemistry Sri Manakula Vinayagar Engineering College	Member
14	**Ms. D.Dheebia** Assistant Professor /Mathematics Sri Manakula Vinayagar Engineering College	Member
16	**Mr.V.Suresh** Sr.Lead Engineer,Qualcom, Chennai	Member (Alumni)

AGENDA OF THE MEETING

Item No.	Particulars
BoS / 2021 / CCE / UG / 3.1	Review and confirm minutes of 2nd BOS meeting held on 27.03.2021
BoS / 2021 / CCE / UG / 3.2	To discuss and approve the syllabi of V and VI Semesters under Regulations 2020 for B.Tech. Computer and Communication Engineering students admitted in the year 2020-21
BoS / 2021 / CCE / UG / 3.3	To discuss and approve the Syllabi of Professional Elective-II offered in the Vsemester and Professional Elective-III offered in the VI semester under Regulations 2020 for the students admitted in the year 2020-21
BoS / 2021 / CCE / UG / 3.4	To discuss and revise the Syllabi of Open Elective-I offered in the IV semester under Regulations 2020 from Department of Computer and Communication Engineering to other B.Tech- Programmes

BoS / 2021 / CCE / UG / 3.5	To discuss the skill development and certification courses in the curriculum under Regulations 2020 for B.Tech. Computer and Communication Engineering for the students admitted in the year 2020-2021 and 2021-2022
BoS / 2021 / CCE / UG / 3.6	To discuss about blended mode of Examination
BoS / 2021 / CCE / UG / 3.7	Any other items for improvement

MINUTES OF THE MEETING

Dr. V.Bharathi, Chairman, BoS initiated the meeting with a warm welcome and introduced the external members, the internal and co-opted members, and thanked them for accepting the invitation to the 3rd BoS meeting. The Chairman proceeded with the presentation to deliberate on the agenda items.

BoS / 2021 / CCE / UG / 3.1

Review and confirm minutes of 2nd BOS meeting held on 27.03.2021

The second BoS Meeting for B.Tech.-Computer and Communication Engineering under regulation 2020 was held on 27-03-2021 and confirmed the following points
- Syllabi of Semesters III and IV
- Syllabi of Professional Elective-I
- Syllabi for the Open Elective-II offered by the Computer and Communication Engineering Department
- Skill Development and Certification Courses
- Admission Details
- The Academic Schedule
- Department Vision, Mission in line with Institute's vision and Mission

Minutes are Reviewed and Confirmed

BoS / 2021 / CCE / UG / 3.2

To discuss and approve the syllabi of V and VI Semesters under Regulations 2020 for B.Tech. Computer and Communication Engineering students admitted in the year 2020-21

The BoS members are discussed elaborately and reviewed the Syllabi of semesters V and VI and suggested the following points

S.No	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R-2020	V	Network security and Cryptography (U20CCT511)	-	Suggested to change course title as Cryptography and Network Security
				III	Name Unit III title as Authentication and Integrity
2	R-2020	V	Microcontroller and Interfacing (U20CCT512)	-	Suggested to include the text book, "M. Saravanan N. Senthil Kumar, S. Jeevananthan, S.K.Shah "Microprocessors and Interfacing 8086, 8051, 8096, and Advanced Processors" oxford press, 2012"
4	R-2020	VI	Wireless		Suggested to include "Cognitive radio,

			Communication Systems (U20CCT615)	V	Ad-hoc and sensor network, evolution of wireless network, MIMO systems"
5	R-2020	VI	Data Science (U20CCT616)	V	Suggested to include recent tools
6	R-2020	VI	Internet programming laboratory (U20CCP610)		Two experiments are suggested to modify using latest tool "React"

Suggestions are considered and updated in the curriculum and syllabi of respective courses. The details are provided in Annexure-I

Approved after these minor changes and recommended to Academic Council.

BoS / 2021 / CCE / UG / 3.3

To discuss and approve the Syllabi of Professional Elective-II offered in the Vsemester and Professional Elective-III offered in the VI semester under Regulations 2020 for the students admitted in the year 2020-21

The members of the Board of Studies reviewed and discussed the syllabi for Professional Electives - II and III which is offered in the fifth and sixth respectively and made the following recommendation:

Professional Elective-II in V semester

S.No	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R-2020	V	Vehicular Communication (U20CCE506)	III	Extend Unit-III with sub titles
2	R-2020	V	Computer Vision (U20CCE509)	II	Change Unit-II title as Feature descriptors instead of Shapes and regions

Professional Elective-III in VI semester

S.No	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R-2020	VI	Satellite Communication (U20CCE611)	II & III	Reduce redundant topics
				IV	Remove ATM via satellite topic
2	R-2020	VI	Wireless Mobile Networking (U20CCE612)	-	Change Course title as Wireless Networking
3	R-2020	VI	Soft computing (U20CCE615)	III & IV	Interchange Unit III and IV

Suggestions are considered and updated in the syllabi of respective course.The details are provided in Annexure-II

Approved the syllabi for Professional Elective-II and Professional Elective-III with above-mentioned changes and recommended to Academic Council.

BoS / 2021 / CCE / UG / 3.4

To discuss and revise the Syllabi of Open Elective-I offered in the IV semester under Regulations 2020 from Department of Computer and Communication Engineering to other B.Tech- Programmes

The BoS members reviewed syllabi of Open Elective–I offered in the curriculum (R-2020) to other Department and suggested the following points

S.No	Regulation	Semester	Subject Name with Code	Unit	Particulars
1	R-2020	V	Introduction to Communication Systems (U20CCO402)	IV	Replace Unit-IV with wireless technologies instead of multiple access techniques
				V	Include Broad band Communication topic

Suggestions are considered and updated in the syllabi of respective courses. The details are provided in Annexure-III

Approved the syllabi of Open Elective-I offered in R-2020 to otherDepartment with above mentioned changes and recommended to Academic Council.

BoS / 2021 / CCE / UG / 3.5

To discuss the skill development and certification courses in the curriculum under Regulations 2020 for B.Tech. Computer and Communication Engineering for the students admitted in the year 2020-2021 and 2021-2022

- The BoS members reviewed the following Skill development courses offered in Semester – V and Semester-VI
    - Foreign Language/ IELTS – I and II
    - Presentation Skill using ICT
    - Technical Seminar
    - NPTEL/MOOC 1

- BOS Chairman listed following Certification course planned to offer for 2020-21 admitted students in the semester II and 2021-22 admitted students in the first semester Courses offered for 2020-21 admitted students

Sl. No.	Course Code	Course Title
1	U20CCCX04	Advanced Python Programming
2	U20CCCX57	Introduction to C Programming
3	U20CCCX91	Web Programming-II

Courses offered for 2021-22 admitted students

Sl. No.	Course Code	Course Title
1	U20CCCX74	Python Programming
2	U20CCCX90	Web Programming-II

Appreciated for the skill development and certification courses offered in curriculum

To discuss about blended mode of Examination

The BoS members reviewed mode of examination conducted in August/September 2021

No of students opted online proctored exam : 44

No of students opted offline exam　　　: 04

Appreciated for the effective and flexible conduction of examination

BoS / 2021 / CCE / UG / 3.7

Any other suggestions for improvement

Suggested to include more number of integrated theory and practical courses in the next revision

The Board of Studies resolved to approve the above suggestions for B.Tech. Computer and Communication Engineering brought forward by the Chairman incorporating the above changes.The meeting was concluded at 12:30 PM with a vote of thanks by **Dr. V. Bharathi**, Head of Department, Computer and Communication Engineering.

Dr. V.Bharathi
Chairman
Professor and Head
Department of CCE, SMVEC

Dr. G. Nagarajan
Professor, Department of ECE
Pondicherry Engineering College, Puducherry

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Assistant Professor /physics

Dr. S. Savithri
Assistant Professor /Chemistry

Ms. D.Dheebia
Assistant Professor /Chemistry

Mr.V.Suresh
Sr.Lead Engineer,Qualcom, Chennai

Revised Semester- V and VI Curriculum

Semester-V

Sl. No.	Course Code	Course Title
Theory		
1	U20BST548	Numerical Methods and Statistics
2	U20CCT510	Database Systems
3	U20CCT511	Cryptography and Network Security
4	U20CCT512	Microcontroller and Interfacing
5	U20CCE5XX	Professional Elective - II[#]
6	U20XXO5XX	Open Elective-II[$]
Practical		
7	U20BSP550	Numerical and Statistical Laboratory
8	U20CCP506	Cryptography and Network Security Laboratory
9	U20CCP507	Microcontroller and Interfacing Laboratory
10	U20CCP508	Database Systems Laboratory
Employability Enhancement Course		
11	U20CCC5XX	Certification Course – V**
12	U20CCS504	Skill Development Course 4: Foreign Language/ IELTS - I
13	U20CCS505	Skill Development Course 5: Presentation Skill using ICT
Mandatory Course		
14	U20CCM505	Indian Constitution
Professional Elective – II (Offered in Semester V)		
1	U20CCE506	Vehicular Communication
2	U20CCE507	Wireless Adhoc and Sensor Networks
3	U20CCE508	Data Mining and Warehouse
4	U20CCE509	Computer Vision
5	U20CCE510	Neural Networks and Fuzzy Logic

Semester-VI

Sl. No	Course Code	Course Title
Theory		
1	U20CCT613	Internet of Things and Applications
2	U20CCT614	Internet Programming
3	U20CCT615	Wireless Communication Systems
4	U20CCT616	Data Science
5	U20CCE6XX	Professional Elective - III#
6	U20XXO6XX	Open Elective-III$
Practical		
7	U20CCP609	Internet of Things Application Laboratory
8	U20CCP610	Internet Programming Laboratory
9	U20CCP611	Wireless Communication Systems Laboratory
Employability Enhancement Course		
10	U20CCC6XX	Certification Course – VI**
11	U20CCS606	Skill Development Course 6: Foreign Language / IELTS - II
12	U20CCS607	Skill Development Course 7: Technical Seminar
13	U20CCS608	Skill Development Course 8: NPTEL / MOOC - I
Mandatory Course		
14	U20CCM606	Essence of Indian Traditional Knowledge
Professional Elective – III (Offered in Semester VI)		
1	U20CCE611	Satellite Communication
2	U20CCE612	Wireless Networking
3	U20CCE613	Information Retrieval
4	U20CCE614	Human Computer Interaction
5	U20CCE615	Soft computing

U20CCT511	**CRYPTOGRAPHY AND NETWORK SECURITY**	**L**	**T**	**P**	**C**	**Hrs**
		3	0	0	3	45

Course Objectives
- To learn basic concepts of information security and various cryptographic algorithms.
- To understand the symmetric and public-key cryptosystem.
- To understand the concepts of message authentication and integrity
- To learn about system security
- To understand the concept of Web security and Firewalls

Course Outcomes
After completion of the course, the students will be able to
CO1- Explain the basic concepts of cryptographic algorithms and its techniques **(K2)**
CO2- Describe the concepts of symmetric and public-key cryptography. (**K3**)
CO3- Evaluate the message authentication and integrity (**K3**)
CO4 - Identify information system requirements for both of them such as client and server. (**K2**)
CO5 - Explain the current legal issues towards information security (**K2**)

UNIT I INTRODCTION   (9 Hrs)
Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security
Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography, key range and key size, possible types of attacks.

UNIT – II SYMMETRIC AND PUBLIC KEY CRYPTOGRAPHY   (9 Hrs)
Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, RC5, IDEA, Block cipher operation, Stream ciphers, RC4.
Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.

UNIT – III AUTHENTICATION AND INTEGRITY   (9 Hrs)
Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Elgamal Digital Signature Scheme.
Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509 Authentication Service, Public – Key Infrastructure

UNIT – IV SYSTEM SECURITY   (9 Hrs)
Transport-level Security: Web security considerations, Secure Socket Layer and Transport Layer Security, HTTPS, Secure Shell (SSH)

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN, IEEE 802.11i Wireless LAN Security

UNIT V SECURITY PRACTICE   (9 Hrs)
E-Mail Security: Pretty Good Privacy, S/MIME **IP Security**: IP Security overview, IP Security architecture, Authentication Header, Encapsulating security payload, Combining security associations, Internet Key Exchange

Text Books
1. William Stallings, Cryptography and Network Security - Principles and Practice, Pearson Education, 6th Edition, 2014.
2. Atul Kahate, Cryptography and Network Security, Mc Graw Hill, 3rd Edition, 2003.
3. Forouzan Mukhopadhyay, Cryptography and Network Security, Mc Graw Hill, 3rd Edition, 2011.

Reference Books
1. C K Shyamala, N Harini, Dr T R Padmanabhan, Cryptography and Network Security, Wiley India, 1st Edition, 2011.
2. Mark Stamp, Information Security Principles, and Practice, Wiley India, 2rd edition 2011.
3. WM. Arthur Conklin, Greg White, Principles of Computer Security, McGraw-Hill, 4th edition, 2015.
4. Neal Krawetz, Introduction to Network Security, CENGAGE Learning, 1st edition, 2007.
5. Bernard Menezes, Network Security and Cryptography, CENGAGE Learning, 1st edition, 2010.

Web References
1. https://nptel.ac.in/courses/106/105/106105031/
2. http://www.cryptography.com/
3. https://www.schneier.com/cryptography.html
4. williamstallings.com/Extras/Security-Notes/
5. www.cs.bilkent.edu.tr/~selcuk/teaching/cs519/

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	3	3	2	1	-	-	-	-	-	1	1	3	2	-
2	3	3	3	2	1	-	-	-	-	-	1	1	3	2	-
3	3	3	3	3	1	1	-	-	-	-	1	1	3	2	2
4	3	3	3	3	1	3	-	-	-	-	1	1	2	2	-
5	3	3	3	2	1	-	-	-	-	-	1	1	2	2	2

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

U20CCT512	MICROCONTROLLER AND INTERFACING	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn about 8051 controller with its architecture programming model, instructions sets and addressing modes.
- To understand the internal peripherals, UART and their modes of operation.
- To introduce the concepts of interfacing microcontrollers with external devices.
- To learn Assembly language programming skills.
- To introduce various advanced processor architectures such Intel Galileo – Arduino.

Course Outcomes

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

CO1 -Describe 8051 controller with its architecture programming model, instructions sets and addressing modes.**(K2)**

CO2 - List and describe the peripherals, UART and their modes of operation.**(K2& K3)**

CO3 - Illustrate the concepts of interfacing microcontrollers with external devices.**(K3)**

CO4 - Illustrate the interrupts handling and demonstrate peripherals applications in C for the target 8051 board.**(K3)**

CO5 -Demonstrate an application by accessing the peripherals in C programming to the target   Galileo board**(K3)**

UNIT I MICROCONTROLLERS   (9 Hrs)

8051 Microcontroller architecture, programming model, instructions sets and addressing modes. Memory organization, stack structure and Interrupts. Assembly level programming for arithmetic operations, Timer operation.

UNIT II INTERNAL PERIPHERALS   (9 Hrs)

GPIO architecture, Timer architecture and modes of operation, Timer peripheral programming, UART and modes of operation-UART programming by polling and interrupt driven-Serial data transfer using 8051-Interrupts in 8051-I/o ports and port expansion.

UNIT III EXTERNAL PERIPHERAL INTERFACING   (9 Hrs)

Port expansion with 8255-ADC, DAC, Keyboard interfacing-Display interfacing LED 7 segment and LCD module. SPI and I2C architecture. Minimum vs Maximum mode of operation.8259 Interrupt controller.8237 DMA controller.

UNIT IV 8051 PROGRAMMING IN C   (9 Hrs)

Cross compiler C -programming structure, Data types, memory models, infinite loops and handling interrupts in C. Intel Hex file format. C-Programming for LED, LCD display, temperature sensor with ADC, Measuring pulse width and frequency.

UNIT V INTEL GALILEO - ARDUINO PROGRAMMING   (9 Hrs)

Galileo Board overview - Arduino IDE, Sketch programming and In-built libraries. Controlling DC motor, stepper motor and servo motor Acquisition of temperature data and send it to serial port. WIFI and Blue tooth shield .Application in Internet of Things (IoT).

Text Books

1. Mazidi Ali Muhammad, MazidiGillispie Janice, and McKinlay Rolin D, "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication, 2rd edition, 2007
2. Kenneth J Ayala, "The 8051 Microcontroller – Architecture, Programming and Applications", Penram International Publications, India, 2016
3. M. Saravanan N. Senthil Kumar, S. Jeevananthan, S.K.Shah   "Microprocessors and Interfacing 8086, 8051, 8096, and Advanced Processors" oxford press, 2012

Reference Books

1. Rajkamal, "Embedded Systems Architecture, Programming and Design", TATA McGraw-Hill, 2nd edition 2015.
2. David E.Simon, "An Embedded Software Primer", Pearson Education Asia, First Indian Reprint, 2012.
3. T Bezboruah, Embedded System Design Based on 8051 and PIC Family Microcontroller, LAP Lambert Academic Publishing, 2011
4. Dogan Ibrahim, "Microcontroller Projects In C for the 8051", Elsevier Science, 2000
5. Uma Rathore Bhatt, "Assembly Language Programming with 8051 Microcontroller", LAP Lambert Academic Publishing, 2016

Web References

1. https://exploreembedded.com
2. https://www.elprocus.com/peripherals-interfacing-to-the-microcontroller-8051-in-electronics/
3. http://www.ti.com/microcontrollers/msp430-ultra-low-power-mcus/overview.html
4. https://developer.arm.com/products/architecture/cpu-architecture
5. https://www.udemy.com/course/8051-microcontroller-embedded-c-and-assembly-language/

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	3	2	1	1	-	-	-	-	-	-	1	3	3	1
2	3	3	2	1	2	-	-	-	-	-	-	1	3	3	1
3	3	3	2	1	2	-	-	-	-	-	-	1	3	3	1
4	3	3	2	1	2	-	-	-	-	-	-	1	3	3	1
5	3	3	2	2	2	2	1	1	3	1	1	1	3	3	1

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

	L	T	P	C	Hrs
U20CCT615 **WIRELESS COMMUNICATION SYSTEMS**	3	0	0	3	45

U20CCT615   **WIRELESS COMMUNICATION SYSTEMS**

Course Objectives

- To learn about evolution of mobile communication technology.
- To understand the basic concepts and terms of cellular system.
- To describe the various medium access control used in wireless communication.
- To learn CDMA based communication systems
- To understand recent wireless technologies.

Course Outcomes

After completion of the course, the students are able to

CO1- Explain development in mobile communication. **(K2)**

CO2- Demonstrate the concepts of cellular system , resource availability and traffic demands.**(K2)**

CO3 -Illustrate the various medium access alternatives for wireless communication.**(K2)**

CO4- Analyze performance of CDMA based system.**(K3)**

CO5 -Explain the principles of recent wireless communication.**(K2)**

UNIT I INTRODUCTION   (9 Hrs)

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Third Generation (3G) Wireless Networks , Wireless Local Loop(WLL), Wireless Local Area network(WLAN), Bluetooth and Personal Area Networks

UNIT II CELLULAR CONCEPT AND SYSTEM DESIGN FUNDAMENTALS   (9 Hrs)

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies Distance to frequency reuse ratio, Channel & co-channel interference reduction factor, S/I ratio consideration and calculation for Minimum Co-channel and adjacent interference, Handoff Strategies, Umbrella Cell Concept, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular System-cell splitting, Cell sectorization , Repeaters, Micro cell zone concept

UNIT –II MEDIUM ACCESS ALTERNATIVES FOR WIRELESS COMMUNICATION   (9 Hrs)

Spread Spectrum Modulation - Pseudo-Noise Codes with Properties and Code Generation Mechanisms -DSSS and FHSS Systems - Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques -Zero Inter Symbol Interference Communication Techniques - Detection Strategies - Diversity Combining Techniques: Selection Combining - Threshold Combining - Equal Gain Combining - Maximum Ratio Combining.

UNIT IV WIRELESS SYSTEMS   (9 Hrs)

GSM system architecture, Radio interface, Protocols, Localization and calling, Handover, Authentication and security in GSM, GSM speech coding, Concept of spread spectrum, Architecture of IS-95 CDMA system, Air interface, CDMA forward channels, CDMA reverse channels, Soft handoff, CDMA features, Power control in CDMA, Performance of CDMA System, RAKE Receiver, CDMA2000 cellular technology, GPRS system architecture.

UNIT V RECENT WIRELESS TECHNOLOGIES   (9 Hrs)

Introduction to Wi-Fi, WiMAX, ZigBee Networks, Software Defined Radio, UWB Radio, Cognitive radio, Ad-hoc and sensor network, evolution of wireless network, MIMO systems, Security issues and challenges in a Wireless network.

Text Books

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson Publications,2nd Edition, 2010.
2. Steve Rackley, Wireless Networking Technology, From Principles to Successful Implementation, Newnes; 1st edition,2011
3. Gottapu Sasibhushana Rao, "Mobile Cellular Communication", Pearson Education, 2012

Reference Books

1. Upena Dalal and Manoj K. Shukla, "Wireless and Mobile Communication", Oxford Press Publications,2016.
2. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2012.
3. Ezio Biglieri and Robert Calderbank, "MIMO Wireless Communications", Cambridge University Press,2015.
4. Kaveh Pah Laven and P. Krishna Murthy, "Principles of Wireless Networks", Pearson Education, 2012
5. William Stallings, "Wireless Communication and Networking", PHI, 2003.

Web References

1. http://nptel.ac.in/courses/117102062/
2. https://onlinecourses.nptel.ac.in/noc17_cs37/
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-452-principles-of-wireless-communications-spring-2006/
4. https://jiscollege.ac.in/ece/Syllabus_MCNT_2018.pdf
5. https://learnengineering.in/ec8652-wireless-communication/

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	-
2	3	2	1	-	1	-	-	-	-	-	1	1	3	2	-
3	3	2	1	-	1	-	-	-	-	-	1	1	3	2	-
4	3	2	1	-	-	-	-	-	-	-	1	1	3	2	-
5	3	2	1	-	-	-	-	-	-	-	1	1	3	2	-

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

	L	T	P	C	Hrs
U20CCT616 **DATA SCIENCE**	3	0	0	3	45

Course Objectives
- To understand the concepts of Real world data representations.
- To learn the Data collection and its strategies in Data Science.
- To understand the Data analytics for Data Science.
- To gain knowledge in Data Science Tools.
- To expose the different opportunities in Industries.

Course outcomes
After completion of the course, the students will be able to
CO1 – Infer the Real world data and information. **(K2)**
CO2 – Explain basic concepts of Data collection and Data Preprocessing **(K2)**
CO3 – Make use of descriptive statistics to organize and summarize the data. **(K2)**
CO4 – Interpret the various Tools and its advantage. **(K3)**
CO5 – Illustrate the different opportunities in Industries. **(K2)**

UNIT I INTRODUCTION   (9 Hrs)
Introduction to Data Science – Evolution of Data Science – Data Science Roles – Scope of Data Science - Stages in a Data Science Project – Data science process- Retrieving data – Cleansing, integrating and transforming data – Data analysis – Build the models – Presenting findings and building applications.– Data Security Issues.

UNIT II DATA COLLECTION AND DATA PRE-PROCESSING   (9 Hrs)
Data manipulation: Reading and selection – Filtering missing data – Sorting – Grouping – Ranking and plotting; Introduction to Python; Fundamental Python Libraries for Data Scientists : Numpy – Scipy – ScikitLearn – Pandas – Matplotlib; IDE; Data Manipulation with Pandas; Sample programs to pre-process and visulaize data

UNIT II EXPLORATORY DATA ANALYTICS   (9 Hrs)
Introduction – Data Preparation – Exploratory Data Analysis: Data summarization – Data distribution – Outlier Treatment – Measuring asymmetry – Continuous distribution; Estimation: Mean – Variance – Skewness and Kurtosis - Box Plots - Pivot Table - Heat Map - Correlation Statistics - ANOVA. Sampling – Covariance – Correlation.

UNIT IV DATA SCIENCE TOOLS   (9 Hrs)
Introduction – Frequentist Approach – Measuring the Variability in Estimates: Point estimates – Confidence intervals; Hypothesis Testing: Using confidence intervals – Using p-values. Introduction to Data Science Tool – Data Cleaning Tools – Data Munging and Modelling Tools -Visualization Tools

UNIT V APPLICATION   (9 Hrs)
Data Economy and Industrialization – Introduction: Data Economy – Data Industry – Data Services – Data Science Application: Introduction – General Application Guidance – Different Domain – Advertising – Aerospace and Astronomy – Arts – Creative Design and Humanities – Bioinformatics – Consulting Services – Ecology and Environment – Ecommerce and Retail – Education – Engineering – Finance and Economy – Gaming.

Text Books
1. Chirag Shah, "A Hands on Introduction to Data Science", Cambridge University Press, 2020.
2. SinanOzdemir, "Principles of Data Science", Packt Publication, 2016.
3. Jiawei Han, Micheline Kamber and Jian Pei, " Data Mining: Concepts and Techniques", Third Edition. ISBN 0123814790, 2011.

Reference Books

1. Steven S. Skiena, "Data Science Design Manual", Spring International Publication, 2017.
2. Davy Cielen, Arno D B Meysman, Mohamed Ali, "Introducing Data Science – Big data, Machine Learning, and more using Python tools", Manning Publications Co, 2016.
3. Laura Igual, Santi Segua, "Introduction to Data Science – A Python Approach to Concepts, Techniques and Applications", Springer Nature, 2017
4. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
5. Mohammed J. Zaki and Wagner Miera Jr, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press, 2014.

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1. https://www.coursera.org/learn/excel-data-analysis
2. https://www.tutorialspoint.com/excel_data_analysis/index.htm
3. https://www.coursera.org/learn/open-source-tools-for-data-science
4. https://www.jeremyjordan.me/data-science
5. https://www.ngdata.com/top-data-science-resourrces

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	2	1	1	-	-	-	-	-	-	-	2	2	2
2	2	2	2	2	2	-	-	-	-	-	-	-	2	2	2
3	2	2	2	2	2	-	-	-	-	-	-	-	2	2	2
4	3	3	3	3	3	-	-	-	-	-	-	-	3	3	3
5	3	2	2	2	2	-	-	-	-	-	-	-	3	2	2

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

U20CCP610	**INTERNET PROGRAMMING LABORATORY**	**L**	**T**	**P**	**C**	**Hrs**
		0	0	3	1	45

Course Objectives
- To be familiar with Web page design using HTML/XML and style sheets
- To be exposed to creation of user interfaces using Java frames and applets.
- To learn to create dynamic web pages using server side scripting.
- To be familiar with the PHP programming.
- To be exposed to creating applications with AJAX.

Course Outcomes
After completion of the course, the students will be able to
CO1- Construct Web pages using HTML/XML and style sheets. (**K3**)
CO2- Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms. (**K3**)
CO3- Develop dynamic web pages using server side scripting. (**K3**)
CO4- Use PHP programming to develop web applications. (K3)
CO5- Construct web applications using AJAX and web services. (**K3**)

 LIST OF EXPERIMENTS
1. Create a web page with the following using HTML
    a. To embed a map in a web page
    b. To fix the hot spots in that map
    c. Show all the related information when the hot spots are clicked.
2. Create a web page with the following.
    a. Cascading style sheets.
    b. Embedded style sheets.
    c. Inline style sheets. Use our college information for the web pages.
3. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.
4. Write programs in Java using Servlets:
    i. To invoke servlets from HTML forms
    ii. Session tracking using hidden form fields and Session tracking for a hit count
5. Write programs in Java to create three-tier applications using servlets for conducting on-line examination for displaying student mark list. Assume that student information is available in a database which has been stored in a database server.
6. Install TOMCAT web server. Convert the static web pages of programs into dynamic web pages using servlets (or JSP) and cookies. Hint: Users information (user id, password, credit card number) would be stored in web.xml. Each user should have a separate Shopping Cart.
7. Redo the previous task using JSP by converting the static web pages into dynamic web pages. Create a database with user information and books information. The books catalogue should be dynamically loaded from the database.
8. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document
9. Write programs in PHP
    i. Validate the form using PHP regular expression.
    ii. PHP stores a form data into database.
10. Write a web service for finding what people think by asking 500 people's opinion for any consumer product.
11. Create an element that you can't change its children or attributes. An element is like a single frame in a movie: it represents the UI at a certain point in time using React elements.
12. Create a components in ReactJs that renders `Welcome` many times.

Reference Books

1. Deitel and Deitel and Nieto, "Internet and World Wide Web How to Program", Pearson Education, 5th Edition, 2011.
2. Robert W.Sebesta, "Programming with World Wide Web", Pearson Education, Eighth Edition,2015.
3. Stephen Wynkoop and John Burke, "Running a Perfect Website", QUE, 2nd Edition,1999.
4. Chris Bates, Web Programming, "Building Intranet Applications", Wiley Publications, 3rd Edition, 2009.
5. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.

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1. www. w3schools.com
2. https://www.javatpoint.com
3. https://www.tutorialspoint.com

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2
4	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2
5	3	3	2	1	2	-	-	-	-	-	1	1	2	3	2

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

Professional Elective

U20CCE506	`VEHICULAR COMMUNICATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives
- To understand standards ,technology and architecture of vehicular communication
- To know the concept of characteristics of network channel and physical connection
- To acquire the knowledge about different types of models and their simulations
- To define the concept of topology and their types with different architecture
- To get idea about multi hop routing and secure hop routing with relevant protocol.

Course Outcomes
After completion of the course, the students will be able to
CO1 - Explain the basic introduction for safety and various layered architecture **(K2)**
CO2 – illustrate the characteristics of physical path and network properties **(K2)**
CO3 – Describe about different models along with their performance of simulations **(K2)**
CO4- -Illustrate and discrimination of different topology for vehicular communication of different architecture **(K2)**
CO5--Apply the different routing protocols in vehicular network for developing the communication. **(K3)**

UNIT I INTRODUCTION AND VEHICLUAR ARECHITECTURE **(9 Hrs)**
Vehicle-to-X (V2X) Communication for Intelligent Transportation Systems (ITS) - safety and non-safety applications, use cases, network service requirements of different applications, V2X communication regimes; Standards and Technologies - layered architecture, infrastructure-based vs. infrastructure-less technologies, Long-Term Evolution (LTE), Dedicated Short Range Communication (DSRC), Wireless Access in Vehicular Environments (WAVE)

UNIT II CHARACTERISTICS AND PHYSICAL LAYER **(9 Hrs)**
Wireless Propagation and Channel Characteristics - path loss, shadowing, small-scale fading, delay spread and Doppler spread, coherence bandwidth and coherence time, techniques for combating wireless channel impairments; Physical Layer - digital modulation schemes in DSRC, design of OFDM in DSRC (symbol time, sub-carrier spacing, pilot spacing);

UNIT III MEDIA ACCESS CONTROL **(9 Hrs)**
Medium Access Control (MAC) - 802.11p EDCA, Digital modulation schemes in 802.11p – Diversity - Equalization - Multicarrier modulation and OFDM - Design of OFDM parameters in 802.11p (symbol time, sub-carrier spacing - pilot spacing) - Transmit power control and transmit masks. multi-channel operation in the WAVE MAC; Routing - flooding, broadcast storm problem.

UNIT IV VEHICLE COMMUNICATION NETWORKS **(9 Hrs)**
A Historical Perspective and Review, CANFD Protocol: Overview of CANFD bus architecture – Physical Layer – Topology – frame architecture – CAN vs CANFD - Bit stuffing and CRC – Delay compensation – Error Handling – LIN Protocol -Overview – Frame Format – Bus Timing – Topology – Error detection – Sleep/Wake-up modes – Applications

UNIT V ROUTING PROTOCOL AND APPLICATION **(9 Hrs)**
Multi hop routing protocol – Ad-hoc on Demand distance vector (AODV)-Grid Location Service (GLS)-GPSR(Greedy Perimeter stateless routing-GSR (Geographic source routing)-Contention based forwarding (CBF), Advanced greedy forwarding (AGF),Preferred group broadcasting(PGB)-Secure hop routing protocol- (ARAN) Authenticated routing for Ad-hoc networking –Secure Ad-hoc on demand vector (SAODV),Secure link state routing (SLSP), Secure position aided Ad hoc routing (SPAAR)-Applications – Overview of Automotive Ethernet protocols

Text Books
1. Claudia Campolo, Antonella Molinaro and Riccardo Scopigno, "Vehicular ad hoc Networks: Standards, Solutions, and Research", Springer, 2015.
2. Richard Zurawski, "Industrial Communication Technology Handbook", Second Edition, CRC Press, 2014.
3. Gilbert Held, "Inter- and Intra-Vehicle Communications", Auerbach Publications, 2007.

Reference Books

1. Christophe Sommer and Falko Dressler, "Vehicular Networking", Cambridge University Press, 2014.
2. Hannes Hartenstein and Kenneth Laberteaux(eds.), "VANET Vehicular Applications and Inter-networking Technologies", John Wiley & Sons, 2009.
3. Chung-Ming Huang and Yuh-Shyan Chen, "Telematics Communication Technologies and Vehicular Networks: Wireless Architectures and Applications", Information Science Publishing, 2009.
4. Theodore S. Rappaport, "Wireless Communications: Principles and Practice", Second Edition, Prentice Hall, 2001.
5. Andrea Goldsmith, "Wireless Communications", Cambridge University Press, 2005.

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1. https://books.google.co.in/books?id=MtBFPWEpwHQC&pg=PA89&lpg=PA89&dq=Vehicular+Communication +syllabus&source=bl&ots=P0KhjJP5SS&sig=ACfU3U1fy8hxDiTUkyJENwZYy9Qwc- PSVw&hl=en&sa=X&ved=2ahUKEwiw3vvsuaHqAhWb8XMBHQ7qDAcQ6AEwCHoECAsQAQ#v=onepage&q =Vehicular%20Communication%20syllabus&f=false
2. file:///D:/Software/M.Tech-AutomotiveElectroinics.pdf
3. http://www.robertoverdone.org/vehicular-communications/
4. https://www.cs.odu.edu/~mweigle/courses/cs795-s07/lectures/1-Intro-VANET.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	3	3	1	-	-	-	-	1	-	1	2	2	2	1
2	3	3	3	2	-	-	-	-	1	-	1	1	2	2	1
3	3	3	3	1	-	-	-	-	1	-	1	1	2	3	1
4	3	3	3	1	-	-	-	-	-	-	1	1	2	3	1
5	3	3	3	2	-	-	-	-	-	-	1	1	2	2	1

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

U20CCE509	**COMPUTER VISION**	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough Transform and its applications to detect lines, circles, ellipses.
- To understand three-dimensional vision and motion analysis techniques.
- To study some applications of computer vision algorithms.

Course outcomes

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

CO1 – Explain basic concepts of image processing techniques required for computer vision. **(K2)**
CO2 - Perform shape analysis, boundary tracking techniques, chain codes. **(K3)**
CO3 - Apply Hough Transform for line, circle, and ellipse detections. **(K3)**
CO4 - Apply 3D vision techniques & motion related techniques. **(K3)**
CO5 - Develop applications using computer vision techniques. **(K3)**

UNIT I IMAGE PROCESSING FOUNDATIONS (9 Hrs)

Review of image processing techniques – classical filtering operations – thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.

UNIT II FEATURE DESCRIPTORS (9 Hrs)

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors moments

UNIT III HOUGH TRANSFORM (9 Hrs)

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

UNIT IV 3D VISION AND MOTION (9 Hrs)

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

UNIT V APPLICATIONS (9 Hrs)

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited 2011.
2. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, "Digital Image Processing and Computer Vision" Cengage Learning, 1st Edition, 2008.

Reference Books

1. E. R. Davies, "Computer & Machine Vision‖, Fourth Edition", Academic Press, 2012.
2. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.
3. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
4. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
5. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.

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1. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-cs58/
2. https://onlinecourses.nptel.ac.in/noc21_ee23/preview
3. https://nptel.ac.in/courses/106/105/106105216/
4. https://www.slideshare.net/Qentinel/what-is-computer-vision

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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2	3	3	2	3	2	1	-	-	-	1	-	1	2	-	2
3	3	3	2	3	2	1	-	-	1	1	-	1	2	-	2
4	3	3	2	3	2	1	-	-	1	1	-	1	2	-	2
5	3	3	2	3	2	1	-	-	1	1	-	1	2	-	2

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

U20CCE611	`SATELLITE COMMUNICATION	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To obtain a basic idea on orbital parameters and launching mechanism
- To understand how the space segment and link design are classified for satellite communication
- To obtain knowledge on various subsystems of earth segment
- To understand the multiple access techniques and network design
- To gain knowledge on various services providing by satellite

Course Outcomes

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

CO1 - Identify Orbital effects in Communication System and analyze performance of Attitude control

CO2 – Analyze various subsystems on space segment and link design of space communication

CO3 – Identify various subsystems on space segment

CO4 -- Analyze and understand the various medium access techniques

CO5 – Have an understanding of various satellite services in satellite communication

UNIT I ORBITS AND LAUNCHING MECHANISM (9 Hrs)

Introduction-Kepler's Laws-Earth-Orbiting Satellite-Orbital Elements-Apogee and Perigee Heights-Orbit Perturbations -Inclined Orbits - Geostationary Orbit- Antenna Look Angles- the Polar Mount Antenna- Limits of Visibility- near Geostationary Orbits- Launching Orbits

UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN (9 Hrs)

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

UNIT III EARTH SEGMENT (9 Hrs)

Introduction – Receiver – Only home TV systems – Outdoor unit – Indoor unit for analog (FM) TV – Master antenna TV system – Community antenna TV system – Transmit – Receive earth stations – Problems – Equivalent isotropic radiated power – Transmission losses – Free-space transmission – Feeder losses – Antenna misalignment losses – Fixed atmospheric and ionospheric losses – Link power budget equation – System noise – Antenna noise – Amplifier noise temperature – Amplifiers in cascade – Noise factor – Noise temperature of absorptive networks – Overall system noise temperature – Carrier to- Noise ratio – Uplink – Saturation flux density – Input back off – The earth station - HPA – Downlink – Output back off.

UNIT IV MULTIPLE ACCESS TECHNIQUE (9 Hrs)

Single access vs. multiple accesses (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Mobile satellite network design, TCP/IP via satellite - Call control, handover and call set up procedures. Hybrid satellite-terrestrial networks.

UNIT V SATELLITE SPECIALIZED SERVICES (9Hrs)

Introduction- Satellite Mobile Services- MSAT- VSATs- RADARSAT- Global Positioning Satellite- Orbcomm-Iridium- INTELSAT service, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV)

Text Books

1. Timothy Pratt, Charles Bostian, Jeremy Allnutt, Satellite Communications, 2nd Edition, Wiley India Pvt. Ltd , 2017
2. D. Roddy, "Satellite Communications", Prentice Hall, 4th edition, copyright, 2008.
3. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.

Reference Books

1. M.Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003
2. Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.
3. N.Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
4. Robert G. Winch, "Telecommunication Trans Mission Systems", McGraw-Hill Book Co., 1983.
5. G.B.Bleazard, "Introducing Satellite communications", NCC Publication, 1985.

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1. http://www.cse.wustl.edu/~jain/cis788-97/satellite_nets/index.htm
2.   http://www.cse.wustl.edu/~jain/cis788-97/satellite_data/index.htm

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
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3	3	3	3	1	-	-	-	-	1	-	-	1	2	3	-
4	3	3	3	1	-	-	-	-	1	-	-	1	2	3	-
5	3	3	3	1	-	-	-	-	1	-	-	1	2	2	-

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

U20CCE615	**SOFT COMPUTING**	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks.
- To learn the fuzzy systems.
- To learn the basic concepts of genetic algorithms.
- To apply soft computing techniques to solve problems.

Course Outcomes

After completion of the course, the students will be able to
CO1- Identify and describe soft computing techniques and their roles in building intelligent machines. **(K2)**
CO2- Apply Artificial neural networks methods for real time problems. **(K2)**
CO3- Use fuzzy logic and reasoning to develop decision making and expert system. **(K2)**
CO4- Apply genetic algorithms to combinatorial optimization problems. **(K2)**
CO5- Describe about Hybrid soft computing techniques and its applications. **(K2)**

UNIT I INTRODUCTION TO SOFT COMPUTING (9 Hrs)

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS (9 Hrs)

Back propagation Neural Networks – Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network – Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines – Spike Neuron Models.

UNIT III GENETIC ALGORITHMS (9 Hrs)

Basic Concepts- Working Principles -Encoding- Fitness Function – Reproduction -Inheritance Operators – Cross Over – Inversion and Deletion -Mutation Operator – Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT IV FUZZY SYSTEMS (9 Hrs)

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets – Classical Relations and Fuzzy Relations -Membership Functions -Defuzzification – Fuzzy Arithmetic and Fuzzy Measures -Fuzzy Rule Base and Approximate Reasoning – Introduction to Fuzzy Decision Making.

UNIT V HYBRID SYSTEMS (9 Hrs)

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination – LR-Type Fuzzy Numbers – Fuzzy Neuron – Fuzzy BP Architecture – Learning in Fuzzy BP- Inference by Fuzzy BP – Fuzzy ArtMap: A Brief Introduction – Soft Computing Tools – GA in Fuzzy Logic Controller Design – Fuzzy Logic Controller.

Text Books

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2nd Edition, 2011.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

Reference Books

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India, 2002.
2. Kwang H.Lee, "First course on Fuzzy Theory and Applications", Springer, 2005.
3. S.Rajasekaran and G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications", Prentice-Hall of India Pvt. Ltd., 2006.
4. George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1996.
5. James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003.
6. Timothy J.Ross, "Fuzzy Logic Engineering Applications", McGraw Hill, NewYork, 3rd edition,2010.
7. Laurene Fauseett, "Fundamentals of Neural Networks", Prentice Hall India, New Delhi, 1994.

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1. https://nptel.ac.in/courses/117/105/117105084/
2. https://nptel.ac.in/courses/106/105/106105173/
3. https://nptel.ac.in/courses/108/104/108104049/
4. http://www.myreaders.info/html/soft_computing.html

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3	3	3	3	2	-	-	-	-	-	-	2	1	3	2	-
4	3	3	3	3	-	-	-	-	-	-	2	1	3	2	-
5	3	3	2	2	-	-	-	-	-	-	-	1	3	2	-

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

U20CCE612	**WIRELESS NETWORKING**	L	T	P	C	Hrs
		3	0	0	3	45

Course Objectives

- To understand the functioning of wireless communication system and evolution of different wireless communication systems and standards.
- To explain GPRS and multiple access techniques for Wireless Communication
- To explain wireless application on protocol and features of mobile services
- To understand the key modules of digital communication systems and encoding techniques
- To evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks

Course Outcomes

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

CO1- Describe the function of PCS and call processing in GSM
CO2- Demonstrate an ability explain GPRS and multiple access techniques for Wireless Communication
CO3- Compare the features of next generation mobile communication networks.
CO4- Describe and analyze the digital communication system with spread spectrum modulation.
CO5- Demonstrate an ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

UNIT I BASICS OF PCS AND GSM   (9 Hrs)

Personal Communication Services (PCS) architecture- Global system for Mobile Communication (GSM) Architecture, GSM frequency spectrum, GSM radio aspects, GSM services, Supplementary services, GSM channel types, call processing in GSM- Mobility Management: Location updates procedure, Temporary Mobile Subscriber Identity, concept of roaming, Location area, routing area, tracking area

UNIT II GPRS AND MOBILE DATA COMMUNICATION   (9 Hrs)

General Packet Radio Services (GPRS) architecture, GPRS Services, Quality of service – GPRS Network nodes, Mobility management and routing in GPRS- WLANs (wireless LANs) IEEE 802.11 standard, RFID- Bluetooth technology, Wi-Max, Wi-Fi- Mobile IP.

UNIT III WIRELESS APPLICATION ON PROTOCOL AND 3G MOBILE SERVICE   (9 Hrs)

Mobile Internet standard, WAP Gateway and Protocols- WML- IMT 2000 specification- W-CDMA, CDMA 2000, Quality of services in 3G Network- UMTS Technology- Features of 4G, 4G LTE, VoLTE, 4.5G,5G.

UNIT IV WLL, SIGNAL ENCODING TECHNIQUES AND SS MODULATION   (9 Hrs)

WLL architecture and technologies- WLL types and application- Concept of LEC networks- Line coding techniques-ASK,BPSK, PCM,DPCM and DM- Types of spread spectrum: DSSS, FHSS

UNIT V APPMOBILE AD-HOC NETWORK AND WSN   (9 Hrs)

MANET, MANET topologies, Features of MANET, Applications, types of MANET Architecture, Design challenges in MANET- Mesh Networking- Wireless sensor network, Applications, Clustering of WSN, Characteristics of WSN-Sensor node: Block diagram, different types of WSN Architecture, Energy efficiency in WSN.

Text Books

1. Theodore S. Rappaport, "Wireless communication- Principles and practice", Pearson publication New Delhi, 2005
2. Lin Yi-Bang, Clamtac Imrich, "Wireless and mobile network Architectures", John Wiley & sons, New Delhi, 2001
3. T.G.Palanivelu, "Wireless and Mobile Communication", PHI learning pvt ltd, 2008

Reference Books

1. Singal T.L., "Wireless Communication", McGraw Hill Education Private Limited, New Delhi, 2010,
2. Talukdar Asoke K, Javagal Roopa R, "Mobile Computing Technology", Hill Education Private Limited, New Delhi, 2010,
3. Willam Stallings, "Wireless Communications and Networks", 2nd edition, Pearson Publisher, 2004
4. Simon Haykin · Michael Moher, "Modern Wireless Communications, Pearson Prentice Hall, 2005
5. Iti Saha Misra, "Wireless Communications and Networks: 3G and Beyond", McGraw Hill Education (India) Pvt Ltd, 2013

Web References

1. https://www.octoscope.com/English/Collaterals/Presentations/octoScope_WirelessTutorial_20090209.pdf
2. www.radio-Electronics.com/info/wireless/Bluetooth/Bluetooth_overview.php
3. https://www.data-alliance.net/blog/5g-4g-3g-standards-lte-gsm-cdma-ism-wcdma-hspa

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	3	3	1	-	-	-	-	-	-	1	1	3	2	-
2	2	2	3	1	-	-	-	-	-	-	1	1	3	2	-
3	3	1	3	1	-	-	-	-	-	-	1	1	3	3	-
4	3	2	3	1	-	-	-	-	-	-	1	1	3	3	1
5	3	1	3	1	-	-	-	-	-	-	1	1	3	2	1

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

OPEN ELECTIVE

U20CCO402	**INTRODUCTION TO COMMUNICATION SYSTEMS** (Common to EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics, BME)	**L** 3	**T** 0	**P** 0	**C** 3	**Hrs** 45

Course Objectives
- To provide basic knowledge of signals
- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To provide knowledge about various multiple access technology and advanced communicationtechniques

Course Outcomes
After completion of the course, the students will be able to
CO1- Comprehend the basic Characteristics of the signals.(**K2**)
CO2- Comprehend needs of modulation and various analog modulation techniques (**K2**)
CO3- Illustrate pulse modulation and multiplexing (**K3**)
CO4- Explain Digital transmission techniques (**K2**)
CO5- Describe multiple access techniques and advanced communication systems.(**K2**)

UNIT I ANALOG COMMUNICATION (9 Hrs)
Need for Modulation-– Block diagram of analog communication System- Amplitude Modulation – AM, DSBSC, SSBSC, modulators and demodulators – Angle modulation – PM and FM – modulators and demodulators – Superheterodyne receivers

UNIT II PULSE COMMUNICATION (9 Hrs)
Low pass sampling theorem – Quantization – PAM –PPM-PWM PCM, DPCM, DM, and ADPCM AndADM - Time Division Multiplexing, Frequency Division Multiplexing

UNIT III DIGITAL COMMUNICATION (9 Hrs)
Comparison of digital and analog communication system- Block diagram of digital communication systemPhase shift keying – BASK,BFSK,BPSK, DPSK, QPSK

UNIT IV WIRELESS TECHNIQUES (9 Hrs)
Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks- cognitive radio, zigbee, Bluetooth, WIFI, WIMAX, overview of 1G to 5G wireless communication, Internet of Things

UNIT V BROADBAND COMMUNICATION (9 Hrs)
Introduction to satellite communication- Fibre Optical Communication System-Microwave communication- Television and Radar communication

Text Books
1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 3rd edition, TMH 2007
2. S. Haykin, "Digital Communications", John Wiley, 2005
3. B.P.Lathi," Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007

Reference Books

1. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
2. B.Sklar," Digital Communications Fundamentals and Applications", 2nd edition Pearson Education2007.
3. A.Bource Carson and Paul B.Crilly, "Communication Systems", 5th Edition, Mc Graw Hill, 2010
4. Torrieri, Don, "Principles of Spread Spectrum Communication Systems", Springer, 2015
5. Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.

Web References

1. www.allaboutcircuits.com
2. https://nptel.ac.in/courses/108/102/108102096/
3. http://www.electronics-tutorials.ws
4. www.tutorialspoint.com
5. https://nptel.ac.in/courses/108/104/108104091/

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
CO1	3	3	1	1	1	-	-	-	-	-	1	1	-	-	-
CO2	3	3	3	1	1	-	-	-	-	-	1	1	-	-	-
CO3	3	3	1	-	1	-	-	-	-	-	1	1	-	-	-
CO4	3	3	1	-	1	-	-	-	-	-	1	1	-	-	-
CO5	3	3	1	-	1	-	-	-	-	-	1	1	-	-	-

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