Sona College of Technology (Autonomous), Salem – 636 005

Department of Electronics and Communication Engineering

Advanced Diploma in Wearable Technology

CURRICULUM & SYLLABI

Academic year – 2021-22

I Year / I Semester

S. No.	Course Code	Course Title	L	T	P	C
		Theory				
1.		Basics of Sensors and its Wearable Application	3	0	0	3
2.		Textile Science: Smart Fibers And Yarns (FT)	3	0	0	3
3.		Analog and Digital Data Acquisition Techniques	3	0	0	3
		Laboratory				
4.		Analog and Digital Circuits laboratory	0	0	2	1
		Total Credits				**10**

I Year / II Semester

S. No.	Course Code	Course Title	L	T	P	C
		Theory				
1.		Wearable Technology and IOT	3	0	0	3
2.		Bio medical instrumentation(BME)	3	0	0	3
3.		Microcontroller and Embedded Systems	3	0	0	3
		Laboratory				
4.		Embedded and IOT lab	0	0	2	1
		Total Credits				**10**

II Year / III Semester

S. No.	Course Code	Course Title	L	T	P	C
		Theory				
1.		Introduction to Data Analytics(IT)	3	0	0	3
2.		Wearable Biomedical Devices and Its Applications (BME)	3	0	0	3
3.		Cloud Computing and Information Security(IT)	3	0	0	3
		Laboratory				
4.		Wearable Biomedical Devices and Vital Physiological Monitoring laboratory	0	0	2	1
		Total Credits				**10**

II Year / IV Semester

S. No.	Course Code	Course Title	L	T	P	C
		Theory				
1.		Woven fabric manufacture and Garment construction (FT)	3	0	0	3
2.		Webpage and Mobile App Development for IoT(IT)	3	0	0	3
		Laboratory				
3.		Woven fabric manufacture and Garment construction Lab(FT)	0	0	2	1
4.		Project	0	0	6	3
		Total Credits				**10**

BASIC SENSORS AND WEARABLE APPLICATIONS **L T P C**
3 0 0 3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

1. Gain the basic idea of measurements, characteristics and the errors associated with measurements.
2. Realize the concept of reactive sensors employed for real life applications
3. Understand the working principle of special purpose sensors and the need for developing smart sensors.
4. Describe the taxonomy of the wearable devices and its design constraints for measuring physical and biological signals.
5. Design and perform experiments on the sensors and develop the projects based on the customer needs.

UNIT I	**INTRODUCTION TO MEASUREMENTS AND SENSORS** Functional Elements of a Measurement System and Instruments, Applications and Classification of Instruments, Types of measured Quantities, Measures of Dispersion, Sample deviation and sample mean, Units and standards, Calibration and errors . General concepts and terminology of Sensor systems, Transducers classification-sensors and actuators, General input-output configurations, Static and dynamic characteristics of measurement system.	9
UNIT II	**SENSORS AND TRANSDUCERS** Thermoelectric sensors, piezoelectric sensors, pyroelectric sensors, photovoltaic sensors, electrochemical sensors, Wearable applications: temperature sensitive fabric, electrochemical sensors. Resistive sensors- Potentiometers, strain gages (piezo-resistive effect), resistive temperature detectors (RTD), thermistors, magnetoresistors, light dependent resistor (LDR), resistive hygrometers, resistive gas sensors. Wearable applications: Strain sensor for monitoring Physiological signals, body movement.	9
UNIT III	**MECHANICAL TRANSDUCERS** Accelerometers: Characteristics and working principle, Types- Capacitive, Piezoresistive, piezoelectric; Gyroscopes: Characteristics and working principle, Rotor Gyroscope; Diaphragm Pressure Sensor –resistive & capacitive type (micro press sensor). Wearable applications: Motion sensors for fall detection, hemiplegic and PD (Parkinson's disease) patients.	9
UNIT IV	**SMART SENSORS AND APPLICATIONS** Integrated and Smart sensors, IEEE 1451 standard & Transducer Electronic Datasheets (TEDs), Overview of various smart sensors: Digital temperature sensor (DS1621, TMP36GZ), Humidity sensor (DHT11, DHT22, FC28), IR sensor (FC51), Gas sensor (MQ2,MQ8), Pressure sensors (BMP180), Accelerometers (ADXL335), etc; Structural health monitoring sensors, Introduction to MEMSand Flexible sensors.	9
UNIT V	**WEARABLE DEVICES** Role of Wearables, Attributes of Wearables, The Meta Wearables – Textiles and clothing, Social Aspects: Interpretation of Aesthetics, Adoption of Innovation, On-Body Interaction; Case Study: Google Glass, health monitoring, Wearables: Challenges and Opportunities, Future and Research Roadmap.	9
	Total	**45**

TEXT BOOKS

1 Jacob Fraden, "Hand Book of Modern Sensors: physics, Designs and Applications", 3rd ed., Springer, 2010.

2 Edward Sazonov, Michael R Neuman, "Wearable Sensors: Fundamentals, Implementation and Applications" Elsevier, 2014

REFERENCE BOOKS

1 Jon. S. Wilson, "Sensor Technology Hand Book", Elsevier Inc., 2005.

2 Subhas C. Mukhopadhyay, "Wearable Electronics Sensors-For Safe and Healthy Living", Springer International Publishing, 2015.

3 Er. R.K. Rajput, "Electronic Measurements and Instrumentation", S. Chand & Company Ltd. 3 rd Edition.

TEXTILE SCIENCE: SMART FIBERS & YARNS **L T P C**

3 0 0 3

COURSE OUTCOMES

At the end of the study of the course, the student will be able to,

1. Classify textile fibers, explain yarn manufacturing process and fabric manufacturing process
2. Explain the types of conductive fibers and processing of conductive yarns. Explains carbon Nano tube yarns
3. Explain textile sensor, types of textile sensor and its manufacturing method
4. Explain micro-electronics and piezo textiles. Explain the manufacturing method of piezo Textiles
5. Explain the applications of smart textiles

Unit – 1 Introduction to Fiber, Yarns and Fabric **9**

Define fiber, Classification of fiber, properties of fibers, yarn manufacturing process – cotton, wool, overview on fabric manufacturing – woven, knitted, non woven, and properties of fabric

Unit – 2 Overview of Conductive fiber **9**

Introduction, Types of conductive fibers, conductive polymer yarns, techniques for processing conductive polymer yarns – wet spinning technique, melt spinning technique, electro spinning, fiber drawing technique, dipping drying technique, chemical solution/vapor polymerization

Overview on carbon nano tube yarns – structure, properties, application

Unit – 3 Textile based sensor **9**

Introduction, types of textile based sensor, manufacturing method – 2d weaving, embroidering, fiber coated, printed sensors

Embroidery and smart textiles, embroided antenna and its application

Unit – 4 Microelectronics and Piezo textiles **9**

Microelectronics for smart textiles, interconnect technology between textiles and electronics

Piezoelectric energy harvesting from intelligent textiles – Introduction, different piezoelectric material, manufacturing Piezo textiles

Unit – 5 Application of Smart textiles **9**

Introduction, Garment integrated wearable electronic products overview, sports, health care, and Military application

Text Books:

1. Tilak Dias, "**Electronic Textiles Smart Fabrics and Wearable Technology**", Woodhead Publications
2. L. Ashok Kumar C. Vigneswaran, "**Electronics in Textiles and Clothing - Design, Products and Applications**", CRC Press
3. Mishra S, "**A text book of fibre science and technology**" New Age International publishers

References:

1. Xiaoming Tao, "**Smart fibres, fabrics and clothing**" , Woodhead publication
2. **A text book of fibre science and technology**" New Age International publishers
3. A.R.Horrocks, S.C.Anand, "**Handbook of technical textiles**", Woodhead publications
4. Howard L. Needles , "**Textile Fibers, Dyes,Finishes, And Processes**", Noyes Publications
5. Bernard P.Corbman, "**Textiles: Fiber to fabric**", McGraw-Hill Companies

ANALOG AND DIGITAL DATA ACQUISITION TECHNIQUES

L T P C

3 0 0 3

UNIT I OPERATIONAL AMPLIFIER AND ITS APPLICATIONS 9

Ideal OPAMP, Differential Amplifier, CMRR, Open & Closed loop circuits, inverting & non inverting amplifiers, voltage follower/buffer circuit. DC characteristics and AC characteristics of op-amp, Adder, comparator, Instrumentation amplifiers and Schmitt trigger.

UNIT II DESIGN OF SIGNAL CONDITIONING CIRCUIT 9

Earthling and grounding, errors due to common mode interference, Wheatstone bridge, common mode rejection ratio, signal level and bias changes, isolation amplifiers, charge amplifiers, Analog filters, phase sensitive detectors. digital and pulse train conditioning, distributed I/O, noise reduction and isolation.

UNIT III ANALOG / DIGITAL CONVERSION 9

Introduction to ADC, Sampling and Holding, S/H practical circuit , Analog multiplexer ,Quantizing and Encoding, Accuracy of A/D converters, Types of A/D converters, Plug-in data acquisition boards- parameter setting- Sampling strategies for multi-channel analog inputs- speed vs throughput.

Introduction to DAC, Types of DACs, D/A boards-parameter setting - timing circuitry-output amplifier buffer- bus interface, Digital I/O boards. Counter-timer I/O boards

UNIT IV INTERFACE STANDARDS , PC BUSES AND DATA LOGGERS 9

RS232, RS422, RS485, GPIB, RJ 11, RJ 45, USB, Firewire; Backplane buses - PCI, PCI-Express,PXI, PXI – Express, VME, VXI; Programming and logging data using PCMCIA cards-stand-alone operation- direct and remote connection to host PC, Host software- data loggers vs internal systems.

UNIT V VIRTUAL INSTRUMENTATION 9

Virtual instrument and traditional instrument, Hardware and software for virtual instrumentation, Virtual instrumentation for test, control, and design, Graphical programming.

Lecture: 45, Tutorial: 00, Total: 45 Hours

TEXT BOOKS

1. Sergio Franco, Design with Operational Amplifiers & Analog Integrated Circuits, 2014, 4th edition, McGraw Hill Higher Education, United States.
2. Ramon Pallas-Areny and John G Webster, Sensors and Signal Conditioning, 2012, 2nd ed.,Wiley India Pvt. Ltd.
3. John Park and Steve Mackay, Practical Data acquisition for Instrumentation and Control, 2011,1st ed., Newness publishers, Oxford, UK.

REFERENCE BOOKS

1. Maurizio Di Paolo Emilio, Data Acquisition systems- from fundamentals to Applied Design,2013, 1st ed., Springer, New York.
2. Robert H King, Introduction to Data Acquisition with LabVIEW, 2012, 2nd ed., McGraw Hill,New York.
3. Robert F. Coughlin and Frederick F. Driscoll, Operational Amplifiers and Linear IntegratedCircuits, 2015, 6th edition, Pearson Education, London.

ANALOG AND DIGITAL CIRCUIT LABORATORY **L T P C**

0 0 2 1

List of Experiments:

1. Design of Inverting and Non-Inverting amplifier using Opamp (IC 741)
2. Design of Differential amplifier to find CMRR using Opamp (IC 741).
3. Design of Schmitt trigger using Opamp (IC 741)
4. Design Wheatstone bridge circuit and find the value of an unknown resistor.
5. Design the various active filters circuits low pass filter, high pass filter, band pass filter, band reject filter.
6. Design the digital to analog converter circuit using op amp.
7. Design the sample and hold circuit using op amp.
8. Design a 4 bit R/2R ladder DAC using 741 op amps by choosing components appropriately and test the circuit.
9. Create a simple VI that simulates an analog signal and plot graph.
10. Measuring strain, temperature, pressure using LabVIEW.
11. Design a Hall effect sensor using LabVIEW.

TOTAL HOURS: 30

WEARABLE TECHNOLOGY AND IOT **L T P C**

3 0 0 3

UNIT I IOT SUPPORTED TECHNOLOGIES: INTERNET/WEB AND NETWORKING BASICS **9**

Components – Direction of Data Flow – Networks – Components and Categories – Types of Connections – Topologies – Protocols and Standards – ISO / OSI Model – TCP/IP Model. IP Addressing, sub-nets.

Overview and working principle of wired and wireless networking equipment's – router, switches, bridges, access points, and hubs. Introduction to web servers and cloud computing.

UNIT II WIRELESS COMMUNICATION STANDARDS AND *APPLICATION PROTOCOLS* **9**

Bluetooth - IEEE 802.15.1, Wireless LAN- IEEE 802.11(WiFi) , Near Field communication, WiMax- IEEE 802.16, LR-WPAN- IEEE 802.15.4 (Zigbee), 6LoWPAN, mobile network, GPS *Application Protocols: MQTT, REST/HTTP, CoAP*

UNIT III FUNDAMENTALS of IOT **9**

Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols - Logical design - IoT communication models, IoT Communication APIs - Enabling technologies - Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates - Domain specific IoTs -IoT Architectural view.

UNIT IV M2M and IOT EMBEDDED PLATFORMS **9**

Introduction – M2M – Difference between IOT and M2M- Software defined networking Overview of Embedded platforms: Arduino, Node MCU, Intel Galileo, Raspberry Pi. Introduction to Web of Things.

UNIT V ROLE OF IOT IN WEARABLE DEVICES AND CASE STUDY **9**

Smart connectivity and Big picture of IoT-smart devices, networks, Wireless technologies and need for data analysis.Evolution of wearable technology, Wearable IoT use cases- Smart watches , Android wear, Smart glasses, fitness trackers, health care devices, cameras, smart clothing. Case studies – Health care, fitness and sports, defence and security, fashion and apparel.

Total: 45 Hours

TEXT BOOKS

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press,2015
2. Raj Kamal, "Internet of Things – Architecture and Design Principles", Mc Graw H ill Education Pvt.Ltd., 2017.
3. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, "Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model", Springer Open, 2013

REFERENCE BOOKS

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017
2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press
3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014

BIO-MEDICAL INSTRUMENTATION **L T P C**
3 0 0 3

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Summarize various aspects of bio-potential recording systems from the body.
2. Interpret the various temperature measurement methods and translate flow of blood as metrics.
3. Describe the special features of various types of measuring equipment based on heart.
4. Outline the objectives and working principles of the various diagnosis and radiological equipment's
5. Computer applications in medical field

UNIT I RECORDING INSTRUMENTS **9**

Electro-Physiology and Bio-potential Recording The Origin of Bio-potentials – Bio-potential Electrodes – Biological Amplifiers – ECG – EEG – EMG – PCG – EOG – Lead Systems and Recording Methods – Typical Waveforms and Signal Characteristics.

UNIT II MEASUREMENT AND ANALYSIS TECHNIQUE **9**

Measurement of Blood Flow – Radiographic – Indicator Dye Dilution – Thermal Convection – Magnetic Blood Flow Rate – Ultrasonic Blood Flow meter – Sphygmomanometer – Blood Gas Analyzer – Oximeter – Auto-Analyzers – Electrophoresis – Colorimeter – Spectrophotometer – Flame Photometer.

UNIT III THERAPEUTIC EQUIPMENTS AND PATIENT SAFETY **9**

Stimulators – Defibrillators – Pacemakers – Diathermy – Respirators – Blood Pumps Ventilator – Haemo-dialysis Machine – Role of Laser in Health Care – Patient Safety – Macro – Micro Shock – Preventive Measures – Earth-Free Patient Monitoring.

UNIT IV MEDICAL IMAGING **9**

X-Ray Imaging and CT scan – Application and X-Ray Therapy – CAT Scan – MRI – PET –Physics of Ultrasound – Ultrasound Imaging – A-Scan and B-Scan Displays – Multi Array Scanning – M-Mode Scanning – Advantages and Disadvantages of Ultrasound Scanning Thermal Imaging Systems.

UNIT V COMPUTER APPLICATIONS IN MEDICAL FIELD **9**

Computer Applications in Medicine – Patient Monitoring System – Endoscopy Unit – Radio-pill – Telemedicine and Medical Informatics.

TOTAL: 45 HOURS

TEXT BOOK

Leislie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2015

REFERENCES

Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2015
Ananda Natarajan.R, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2015.

Microcontroller and Embedded Systems

L	T	P	C
3	0	0	3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

Analyze the functionality of each block in 8051 microcontroller

Design an electronic system using PIC microcontroller

Analyze hardware and software architecture of any embedded systems

Develop embedded design using suitable RTOS objects.

Develop the application based on 8051 using embedded C programs.

UNIT I	**8051 Embedded Controller** Architecture of 8051 Microcontroller – signals – I/O ports – memory – counters and timers – serial data I/O – interrupts.	**9**
UNIT II	**PIC Embedded Controller** PIC 16C61 / 71 microcontroller architecture – FSR – Reset action – Oscillatory connections – Memory organizations- Instructions-Addressing modes-I/O ports-Interrupts-Timers-ADC in PIC 16C61 / 71 microcontroller.	**9**
UNIT III	**ARCHITECTURE OF EMBEDDED SYSTEMS** Introduction – Application Areas – Categories of Embedded System – Specialties of Embedded System – Recent Trends in Embedded System – Overview of Embedded System Architecture – Hardware Architecture – Software Architecture – Communication Software –Process of Generation of Executable Image – Development-Testing Tools.	**9**
UNIT IV	**Design of Embedded Systems** Hardware design-Selection of processor-Software design- -Implementation-Integration and testing-Types of testing-Types of Hardware Platforms-Hardware description of AVR microcontroller development and its features-Introduction to RTOS –Architecture of the kernel-Scheduling Algorithms-FIFO-Round Robin-Shortest job firs-Semaphores.	**9**
UNIT V	**Embedded 'C' programming in 8051** Data types and time delay – I/O Programming –Switch interface- LCD display interface-7 segment display interface-sensor interface-Logic Operations.	**9**

Total: 45

TEXT BOOKS

1. Ajay V Deshmukh, "Microcontrollers [Theory and Applications]", McGrawHill, 2017.
2. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dreamtech press, 2016.

REFERENCE BOOKS

1. Mazidi,Mazidi & McKinlay, "8051 Microcontroller and Embedded System", Pearson New International Edition, 2nd Edition, 2014.
2. Raj Kamal "Embedded Systems Architecture Programming and Design" 2nd Edition TMH, 2010.
3. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", 4th Edition —Morgan Kaufmann Publisher (An imprint from Elsevier), 2016

Embedded and IOT laboratory

L T P C

0 0 2 1

Course Outcomes

At the end of each experiment, the students will be able to -

1. Design an embedded system to get input from and to display using microcontrollers. (8951Microcontroller, Arduino UNO).
2. Design a system by interfacing analog and digital sensors with microcontrollers using various communication protocols. (8951 Microcontroller, Arduino UNO and Node MCU)
3. Design a system by interfacing with latest microcontrollers like Intel Galileo Gen 2 board and Raspberry Pi 3.

List of Experiments:

1. Study of Raspberry-Pi, Node MCU, Arduino and 89C51 controller .
2. Study of Textile based electrodes as temperature sensors &strain sensors.
3. Study of Wearable motion sensors, body temperature sensors, PPG and SPO2 monitoring system.
4. Design the circuit for interfacing LED with 89C51.
   a) Design a circuit diagram to interface 8-LED' with 89C51.
   b) Design a program to glow alternate LED's in the above hardware.
   c) Design a program to glow LSB LED's in the above hardware.
   d) Design a program to turn on and turn off the LEDs with time delay.
   e) Design a program to turn on and turn off LSB and MSB alternatively in the above hardware
5. Design the embedded system to interface 7-Segment display system with 89C51.
   a) Design the circuit to interface 7-segment LED with 89C51 microcontroller.
   b) Design a program to display the Character 'A' using 7-segment display and 89C51.
   c) Design a program to display the any single digit numeric number using 7-Segment display and 89C51.
   d) Design a program to display the counter value. The values start from 0 to 9
6. Develop the embedded system to activate serial communication of Arduino UNO.
   a) Design the program to transmit the character "Embedded System Lab" by Arduino UNO at the baud rate of 9600 bps. b) Design the program to transmit the character "Welcome to SONA" through the RS232 channel of Arduino at the baud rate of 19600 bps.
   c) Design the program to transmit the character "ARDUINO LIFE" to the PC monitor at the rate of 4800 bps.
7. Design the embedded system to interface analog linear temperature sensor LM35 with Arduino UNO.
   a) Design the circuit to interface LM35 with Arduino UNO controller.
   b) Design the program to read the temperature of the room and display the temperature in Celsius and Fahrenheit.

c) Design the program to read the temperature of the room. If the temperature goes greater than 32^{o} , give the emergency buzzing and red LED alert.

8. Study of different operating systems for Raspberry-Pi /Beagle board. Understanding the process of OS installation on Raspberry-Pi /Beagle board
9. Understanding the connectivity of Raspberry-Pi /Beagle board circuit with IR sensor. Write an application to detect obstacle and notify user using LEDs.
10. Understanding and connectivity of Raspberry-Pi /Beagle board with camera. Write an application to capture and store the image.
11. Interfacing of analog, digital and ultrasonic sensors with Node MCU.

TOTAL HOURS: 30

INTRODUCTION TO DATA ANALYTICS

L T P C

3 0 0 3

Course Outcomes:

At the end of the course, the student will be able to

- Explain the significance of data analysis in wearable technology
- Apply the techniques of data pre-processing and visualization.
- Analyse data using statistical techniques.
- Identify real world applications that can be tackled with data analytical techniques
- Design and implement efficient data analytic solutions for real world applications

Unit 1 Introduction 9

Wearables and big data- potential challenges, intelligent data analysis, analytic processes and tools, analysis Vs reporting;

Unit 2 Statistical concepts 9

properties of an attribute: Mean, Median, Mode; Range, Variance, Standard Deviation; Expectation and Variance, probability distributions, sampling distributions, measures of similarity and dissimilarity, multi-dimensional vector spaces

Unit 3 Data pre-processing and visualization 9

Data pre-processing: types of error and error handling, filtering, data transformation, data merging; Data Visualization: - plots and projection methods- 2D and 3D scatter diagram, principle component analysis, histogram, spectral analysis-amplitude, phase spectra, cosine and sine transform

Unit 4 Statistical modelling - Correlation and Regression 9

Correlation- Linear correlation, Correlation and causality, Chi-square test for independence; Regression – Simple Linear Regression-least squares principle - Multiple linear Regression – Robust Regression – Cross validation- logistic regression; forcasting

Unit 5 Supervised and Unsupervised Techniques 9

Classification-Naïve Bayesian classifier, Back propagation neural network, decision trees, support vector machine, fuzzy decision trees; Clustering- K Nearest Neighbor, K-Means, Fuzzy C Means, Deep learning concepts

TOTAL : 45 HOURS

Text Book:

Thomas A Runkler, Data Analytics: Models and Algorithms for Intelligent Data Analysis, Springer, 2012

References:

1. Montgomery, Douglas C., and George C. Runger. Applied Statistics and Probability for Engineers. John Wiley & Sons, 2010
2. Kevin P. Murphy & Francis Bach, Machine Learning: A probabilistic perspective , MIT Press, 2012
3. Trevor Hastie, Robert Tibshirani & Jerome Friedman, The Elements of Statistical Learning: Data Mining, Inference, and Prediction, Springer, 2017

4. Shai Shalev-Shwartz, Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms, Cambridge University Press, 2014

WEARABLE BIOMEDICAL DEVICES AND ITS APPLICATIONS **L T P C**

3 0 0 3

COURSE OUTCOMES

At the end of the course, the student will be able to,

Summarize the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues
Explain the sensor and signal processing requirement of wearable systems
Outline the communication and security aspects
Elucidate the level of energy involvement in wearable systems
Demonstrate the wearable systems applications

UNIT I SENSORS **9**

Need for wearable systems, Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, Inductive plethysmography, Impedance plethysmography, pneumography, Wearable ground reaction force sensor, GSR, Radiant thermal sensor, Wearable motion sensors, CMOS –Based Biosensors, E-Textiles, Bio compatibility

UNIT II SIGNAL PROCESSING **9**

Wearability issues -physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, Constraint on sampling frequency for reduced energy consumption,light weight signal processing, Rejection of irrelevant information, Datamining.

UNIT III ENERGY HARVESTING FOR WEARABLE DEVICES **9**

Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.

UNIT IV WIRELESS HEALTH SYSTEMS **9**

Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture — Introduction, Wireless communication techniques.

UNIT V APPLICATIONS OF WEARABLE SYSTEMS **9**

Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, Multi parameter monitoring, Neural recording, Gait analysis, Sports Medicine, Smart Fabrics

TOTAL: 45 HOURS

TEXT BOOKS:

1. Annalisa Bonfiglio, Danilo De Rossi, "Wearable Monitoring Systems", Springer,2011.
2. Sandeep K.S. Gupta, Tridib Mukherjee, Krishna Kumar Venkata subramanian, "Body AreaNetworks Safety, Security, and Sustainability," Cambridge University Press,2013.

REFERENCES:

1. Hang,Yuan-Ting, "Wearable medical sensors andsystems",Springer-2013.
2. Mehmet R. Yuce, Jamil Y. Khan, "Wireless Body Area Networks Technology, Implementation and Applications", Pan Stanford Publishing Pvt. Ltd, Singapore,2012.
3. Guang-Zhong Yang(Ed.), "Body Sensor Networks, "Springer,2006.
4. Andreas Lymberis, Danilo de Rossi ,'Wearable eHealth systems for Personalized Health Management - State of the art and future challenges ' IOS press, The Netherlands,2004.

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CLOUD COMPUTING & INFORMATION SECURITY	L	T	P	C
	3	0	0	3

COURSE OUTCOMES

At the end of each unit, the students will be able to -

Identify the suitable cloud computing model and services for the given application and Interpret the role of virtualization in cloud computing

Deploy private and public cloud in real-time environment

Explain the essential fundamentals of information security and apply the Laws and code of Ethics in Information Security

Describe the access control mechanism used for user authentication and authorization, Maintain security infrastructure

Analyze various threats and risks associated with cloud security

UNIT I	**OVERVIEW OF CLOUD COMPUTING & VIRTUALIZATION** Brief history and evolution - History of Cloud Computing, Evolution of Cloud Computing, Traditional vs. Cloud Computing - Why Cloud Computing, Cloud service models (IaaS, PaaS & SaaS). Cloud deployment models (Public, Private, Hybrid and Community Cloud), Benefits and Challenges of Cloud Computing - Basics of virtualization, Server virtualization, VM migration techniques, Role of virtualization in Cloud Computing	**9**
UNIT II	**WORKING WITH PRIVATE AND PUBLIC CLOUDS** Private Cloud Definition - Characteristics of Private Cloud - Private Cloud deployment models, Private Cloud Vendors – Benefits and Challenges - Private Cloud implementation in Amazon EC2 service What is Public Cloud - Why Public Cloud - When to opt for Public Cloud - Public Cloud Service Models and Public Cloud Vendors and offerings (IaaS, PaaS, SaaS) - Private vs. Public Cloud – When to choose	**9**
UNIT III	**RISK MANAGEMENT AND SECURITY POLICY AND STANDARDS** Risk Management: Risk Identification, Risk Assessment, and Risk Control Strategies. Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model.	**9**
UNIT IV	**SECURITY TECHNOLOGY, IMPLEMENTING INFORMATION SECURITY AND SECURITY MAINTENANCE** Access Control, Firewalls, Protecting Remote Connections, Intrusion Detection and Prevention Systems, Scanning and Analysis Tools. Information Security Project Management, Technical and non-technical Aspects of Implementation, Security Management Maintenance Models, Digital Forensics.	**9**
UNIT V	**OVERVIEW OF CLOUD SECURITY** Explain the security concerns in Traditional IT - Introduce challenges in Cloud Computing in terms of Application Security - Server Security and Network Security - Security reference model - Abuse and Nefarious Use of Cloud Computing - Insecure Interfaces and APIs - Malicious Insiders - Shared Technology Issues - Data Loss or Leakage - Account or Service Hijacking	**9**

Total: 45

TEXT BOOKS

1. Cloud Computing: Principles and paradigms By Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, 2011
2. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003.

REFERENCE BOOKS

1. Cloud Computing: A Practical Approach, By Anthony T. Velte, Toby J. Velte, and Robert Elsenpeter, McGraw Hill, 2010.
2. Handbook of Cloud Computing, By Borko Furht, Armando Escalante (Editors), Springer, 2010
3. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3, CRC Press LLC, 2004.
4. Cloud Computing for dummies, By Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, 2009.

WEARABLE BIOMEDICAL DEVICES AND VITAL PHYSIOLOGICAL MONITORING LABORATORY

L T P C

0 0 2 1

COURSE OUTCOMES

- Record the electrical impulses of heart, muscle and brain using wearable electrodes system.
- Measure the blood pressure using wearable pressure sensors and respiration rate and body temperature.
- Measurement of vital physiological parameter

List of Experiments

1. To record the electrical activity of heart using wearable ECG system.
2. To record the electrical activity of muscles using wearable EMG system.
3. To record the electrical pattern of brains Using wearable EEG system.
4. To record the blood pressure Using wearable pressure sensors.
5. To record the respiration rate using accessories.
6. To record Galvanic Skin Resistance using wearable electrodes.
7. To record body temperature using wearable temperature sensor.
8. Measurement of vital parameter using Multi parameter monitoring.

TOTAL HOURS: 30

WOVEN FABRIC MANUFACTURE AND GARMENT CONSTRUCTION

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COURSE OUTCOMES

At the end of the study of the course, the student will be able to,

1. Explain yarn and classify it. Explain the properties of fibers. Explain production of yarns
2. Explain the fabric manufacturing process of woven, knitted, non woven
3. Describe the various pattern making tools in the workroom and the measuring techniques
4. Explain the method of drafting basic body slopers and types of fullness
5. Apply types of seams, seam finishes, stitches and trims for suitable end uses.

Unit – 1 Basics of Yarn production **9**

Yarn and its types, Classification of fibers, Properties of fibers, Production of yarn- Ring spinning, rotor spinning, friction spinning, wrap spinning, air jet spinning, twist less spinning

Unit – 2 Fabric Manufacturing **9**

Preparation – winding, warping & sizing, drawing-in and tying-in, weaving – shedding mechanism, fill insertion, special weaving methods, knitting – warp knitting, weft knitting, wet processing and finishing

Unit – 3 Measurement and workroom process **9**

Flow process chart of garment manufacturing.

Pattern: Definition, Importance, Types: basic pattern, working pattern and production pattern; **Pattern making:** Definition, Techniques: drafting and draping; Pattern making tools and workroom terms and definitions.

Measuring techniques: Introduction to standard measurement charts, Body measurements: circumference, Vertical and horizontal measurements and measuring the form.

Unit – 4 Block preparation and fullness **9**

Drafting of basic bodice, Skirt blocks, Trouser and sleeve

Define dart, dart - single, double pointed dart

Overview different types of sleeves, collars, pockets, cuff.

Overview of Trims- zippers, button, button holes, hooks, eye snaps, velcro, eyelets, cords and their applications

Unit – 5 Seams and stitches **9**

Sewing Machine: Fundamentals of sewing machine, types and applications

Stitches: Definition, classification of stitches, stitches parameters, selection of stitches.

Seams: Definition, seam quality, seam performance, selection of seam, seam finishes.

Sewing thread: Selection of sewing thread for woven and knitted garments.

Text Book:

1. Helen Joseph Armstrong "**Pattern Making for Fashion Design"** 5 th Edition, Pretence Hall, New Jercey , 2014.
2. Laing, Webster J "**Stitches and Seams**" Woodhead Publishing Ltd., 1998.
3. Mishra S, "**A text book of fibre science and technology**" New Age International publishers

References:

1. A.R.Horrocks, S.C.Anand, "**Handbook of technical textiles**", Wood head publications
2. Howard L. Needles , "**Textile Fibers, Dyes, Finishes, And Processes**", Noyes Publications
3. Harold Carr and Barbarra Latham, "**The Technology of clothing manufacture"** Blackwell scientific publication
4. Pradip V. Mehta, " **Managing quality in the apparel industry**", New Age International publishers

Webpage and Mobile App Development for IoT

L T P C

3 0 0 3

COURSE OUTCOMES

At the end of the course, the student will be able to

1. Design a web page for any application using HTML and CSS, Create an interactive and semantic web page using Java scripts
2. Write server side programs using open source technologies such as PHP and MySQL
3. Explain development framework and the need for mobile applications.
4. Create applications with layouts, framework and Develop applications with intents and broadcast receivers.
5. Develop applications with database connectivity.

UNIT I INTRODUCTION TO INTERNET, HTML, CSS and Java Script 9

HTML 5 and CSS 3 9 History of Internet, WWW- HTML Common tags- List, Tables, images, forms, Frames- CSS3: Selectors ,Box Model, Backgrounds, Image Values and Replaced Content, Text Effects - Java Script control structures, Dynamic HTML- Javascript document object model - Event Handling - Window Object - Document object - Browser Object - Form Object - Navigator object - Screen object - User defined object – Cookies

UNIT II PHP AND MYSQL 9

PHP: Introduction,syntax,variables,strings,operators,if-else,loop,switch,array,function,form, mail, fileupload, session, filters, PHP-ODBC. MySQL: Introduction– Setting up account– Starting, terminating and writing your own SQLprograms - PHP and SQLdatabase – PHP Connectivity.

UNIT III INTRODUCTION TO ANDROID **9**

Android: An Open Platform for Mobile Development– Android SDK Features-Introducing the development framework - Standard development environment for Android applications – Creating Your First Android Application – Types of Android Application- Android Development Tools. Challenges of the mobile platform

UNIT II CREATING APPLICATIONS AND ACTIVITIES **9**

Introducing the Application Manifest File- Using the Manifest Editor- Externalizing Resources- Android Application Lifecycle – Introducing the Android Application Class – Android Activities - Fundamental Android UI Design- Android User Interface Fundamentals- Introducing Layouts- Introducing Fragments, Creating New Views- Introducing Adapters - Intents- Creating Intent Filters and Broadcast Receivers- Using Internet Resources.

UNIT IV DATABASES AND CONTENT PROVIDERS **9**

Shared Preferences – Working with the file systems - Introducing Android Databases- Introducing SQLiteContent Values and Cursors- Working with SQLite Databases- Creating Content Providers- Using Content Providers

TEXT BOOKS

1. Internet and World Wide Web – How to program by Paul J. Deitel , Harvey M.Deitel, 5th Edition, PHI/Pearson Education Asia, 2012.
2. Reto Meier, "Professional Android Application Development", Wiley, 2012

REFERENCES

1 . N P Gopalan, J Akilandeswari, " Web Technology – A developers Perspective", PHI Learning Pvt. Ltd., New Delhi, 2014.
2.. Ullman,"PHP fortheWeb:VisualQuickStartGuide", 5 rd Edition, PearsonEducation, 2016.
3. http://developer.android.com/develop/index.html
.4. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012

WOVEN MANUFACTURE AND GARMENT CONSTRUCTION LABORATORY **L T P C**

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COURSE OUTCOMES

At the end of the study of this course the students will be able to,

1. Draft and construct samples for basic blocks, seam and seam finishes and fullness
2. Develop conductive fabric

List of Experiments

I. **Drafting of Bodice blocks, skirt blocks and sleeve blocks** (2 sessions)

II. **Drafting of Trouser blocks** (2 sessions)

III. **Prepare samples of Basic seams** (1 sessions)

IV. **Prepare samples of basic garment components** (1 sessions)

V. **Develop conductive fabric using dip coating and dry methodology** (1 sessions)

VI. **Develop knit fabric sample using yarn** (2 sessions)

VII. **Develop conductive fabric patch using embroidery methodology** (1 sessions)

Total: 30 hours

List of equipment required for a batch of 30 students

S. No.	Name of the equipment / software	Quantity Required
1.	Single-needle lock-stitch machine	30
2.	Steam Iron	3
3.	Fusing Machine	1
4.	Core and Sheath Spinning	1
5.	Cork Top Tables	8
6.	Hot air oven	1
7.	Tensile strength tester	1
8.	Light fastness tester	1
9.	Tearing strength tester	1
10.	Fabric knit machine	1
11.	Digi washer	1
12.	Fabric embroidery machine	1
	Total	**50**