SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

B. Tech. Semester II/IV

Subject Name: Wearable Technology **Subject Code: BTEC15702**

Type of course: OE

Prerequisite: Passion to explore technology

Rationale: The history of wearables in contemporary culture and art from the earliest forms to present day will enhance understanding and ability to analyse the relationship of technology to the body, social interaction, and environment. Miniaturization in sensors, open dimension of the Wearable technology with explosive growth and exciting applications in the fields of medicine, sports, fitness, entertainment, as well as new ways for people to interact, communicate, and experience the environment around them.

Teaching and Examination Scheme:

Teaching Scheme				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	100
3	0	0	3	60	25	15	--	--	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module % Weightage
1.	**Introduction:** Intelligent wearable device description, Intelligent wearable device pedometer algorithm and evaluation, Application development (ThingSpeak server Virtuino app), Sensing parameters, signal processing, RF Communication, Batteries, Energy Harvesting, Power Management for Wearable Technology, Wireless Body Area Networks (WBANs) and Flexible Substrate Technology	6	15
2	**Sensors and Signal Processing:** Types of sensors, Ambient sensors and Wearable sensors, inertial sensors: Accelerometer, Gyroscopes, Pressure sensors, Magnetic field sensors, Location sensors, Physiological sensors like heart rate, blood oxygen etc, Blood pressure cuff, Electrocardiogram (ECG), Spirometer, Electrooculography (EOG), galvanic skin response (GSR), Image sensors, Characteristics and working principle of capacitive, piezoresistive, piezoelectric sensors, Motion sensors for fall detection	8	20
3.	**Factors in Wearable Technology:**	6	15

	Faster and Cheaper Hardware, Cloud Storage, Location Data Quantified Self Activity, Gaming Industry, Visual & Voice Technology, User Experience		
4	**Applications of Wearable Technology**: Classification of Wearable Devices: Lifelogger, Gesture recognizers, Entertainer, Assistant for Regular, Creative, Emergency Jobs, Wearable devices in Healthcare, WBAN, Data aggregation, Communication, Three Phases of healthcare: Clinical care, Remote monitoring, Context awareness, Applications in home automation, personal fitness, Fashion accessories like Smart glasses, GPS enabled shoes, Activity monitoring watches.	8	20
6.	**Security and privacy-preserving WIBSN-based health monitoring applications:** WIBS-based healthcare system, The system architecture, A three-layered communication architecture Health monitoring applications, Primary attacks targeting healthcare applications, Eavesdropping on radio communications among sensors, Denial of service: attacks against system availability and integrity, Security and privacy requirements, Security awareness and privacy preservation techniques, Proximity-based access control mechanism, Biometrics-based privacy preserving mechanisms, External/wearable hardware-based solutions, Comparison of security techniques, Emerging security challenges	8	20
7.	**Active Learning Assignment**	6	10

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
15	20	20	15	15	15

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**
Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Wearable and Implantable Medical Devices:	Dey, Nilanjan, Amira Ashour, Simon James	Academic Press	2019	Latest

	Applications and Challenges.	Fong, and Chintan Bhatt			
2.	Wearable technology in medicine and health care	Tong, Raymond, ed	Academic Press	2018	Latest
3.	Wearable electronics sensors: For safe and healthy living	Mukhopadhyay, Subhas C	Springer	2015	VOl.15
4.	HandBook of Modern Sensors: physics, Designs and Applications	Jacob Fraden	Springer	2015	3rd
5.	Wearable Sensors: Fundamentals, Implementation and Applications	Edward Sazonov, Michael R Neuman	Elsevier	2014	Latest

Course Outcome:

Sr. No.	CO Statement After learning this subject students will be able to,	Marks % weightage
CO-1	Identify and understand the need for development of wearable devices and its influence on various sectors.	15
CO-2	Analysed the applications of various wearable inertial sensors for biomedical applications.	15
CO-3	Comprehend the design and development of various wearable bio-electrode and physiological activity monitoring devices for use in healthcare applications.	15
CO-4	Acquaint the usage of wearable devices as assistive devices, diagnostic devices and other modern applications	15
CO-5	Identify the use of various wearable locomotive tools for safety and security, navigation and select appropriate protocols, wireless techniques for the problem	20
CO-6	Design and develop various wearable devices for detection of biochemical and physiological body signals, environmental monitoring, safety and navigational assistive devices.	20

Mapping with POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	-	-	-	-	-	1	2	-	-	-	-	-
CO-2	2	2	3	2	3	1	1	-	-	-	2	2
CO-3	2	2	3	2	2	1	1	-	2	2	2	2
CO-4	2	2	3	2	2	1	1	2	2	2	2	2
CO-5	2	2	3	2	2	1	1	2	2	2	2	2
CO-6	2	2	3	2	3	2	2	1	2	2	2	2