

Syllabus for B.Sc(Embedded System)

A typical Credit Distribution

Sem	Core Courses			Elective (for others from Embedded system Department)	Foundation Courses		Extra Curricular	Total Credit for the semester(s)
	P/CS	M	ES		Compulsory	Elective		
I	3	3	3	1	4	1	1	16
II	3	3	3	1	4	1	1	16
III	3	3	3	1	4	1	1	16
IV	3	3	3	1	4	1	1	16
V	6	6	6	-	-	-	-	18
VI	6	6	6*	-	-	-	-	18
Total	24	24	24	04	16	04	04	100 (+4)

* VI semester is for project work in Embedded Systems.

Semester	Core Papers	Open Elective
I	C Programming (BSCEMB 131)	Embedded system in Daily Life (BSCEMB 133)
	Practical 1 (BSCEMB 132)	
II	Introduction of Arduino (BSCEMB 181)	Basic Understanding of Internet of Things (BSC EMB 183)
	Practical 2(BSCEMB 182)	
III	Interfacing using PIC 18F microcontroller (BSCEMB 231)	Introduction to arduino (BSCEMB 233)
	Practical 3(BSCEMB 232)	
IV	Python programming (BSCEMB 281)	Introduction to Smart City (BSCEMB 283)
	Practical 4(BSCEMB 282)	
V	Raspberry pi(Programming in Python) (BSCEMB 331)	-----
	IOT using Raspberry Pi and Aurduino (BSCEMB 332)	
	Practical 5(BSCEMB 333)	
VI	Project Work (BSCEMB 381)	

Scheme of Examination

Semester 1							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCMEB 131	C Programming	4hrs	3 hr	20	80	100	2
BSCEMB 132	Practical 1	3 hrs	3 hr	10	40	50	1
Total						150	3
Semester 2							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCEMB 181	Introduction to Arduino	4hrs	3 hr	20	80	100	2
BSCEMB 182	Practical 2	3 hrs	3 hr	10	40	50	1
Total						150	3
Semester 3							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCEMB 231	Interfacing using PIC18F microcontroller	4hrs	3 hr	20	80	100	2
BSCEMB 232	Practical 3	3 hrs	3 hr	10	40	50	1
Total						150	3
Semester 4							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCEMB 281	Python programming	4hrs	3 hr	20	80	100	2
BSCEMB 282	Practical 4	3 hrs	3 hr	10	40	50	1
Total						150	3
Semester 5							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCEMB 331	Raspberry pi (Programming in Python)	4hrs	3 hr	20	80	100	2
BSCEMB 332	IOT using Raspberry Pi and Arduino	4hrs	3hr	20	80	100	2
BSCEMB 333	Practical 5	4 hrs	4 hr	20	80	100	2
Total						300	6
Semester 6							
Subject code	Title	Marks			Credits		
		IA	Dissertation /Viva	Total			
BSCEMB 381	Project Work	40	160	200	4		
	Literature Review	50	-	50	1		
	Project	10	40	50	1		

	Demonstration				
Total				300	6

Scheme of Examination for Open Electives

Semester 1							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCSEMB 133	Embedded System for Daily Life	2	2hr	10	40	50	1
Semester 2							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCSEMB 183	Basic Understanding of Internet of Things	2	2 Hr	10	40	50	1
Semester 3							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCSEMB 233	Introduction to arduino	2	2 Hr	10	40	50	1
Semester 4							
Subject code	Title	Theory Hrs/week	Duration of Exam	Marks			Credits
				IA	Exam	Total	
BSCSEMB 283	Introduction to Smart City	2	2 Hr	10	40	50	1

C Programming (BSCEMB 131)
(Credits: Theory-02, Practicals-01)
Theory Lectures 48 HOURS

UNIT – I

(12 Hours)

Algorithm- Features, simple examples. **Flowchart** –Symbols used in a flowchart, suitable examples. **Program Translators** – Assembler, Compiler, and Interpreter. **Programming languages** -Machine level language, Assembly level language, High level languages. **Overview of C:** Importance of C, character set, C tokens, Constants, variables and data types. Declaration of variables, assigning values to variables. Data type conversion, basic structure of C program, executing a C program, sample C program. **Operators in C:** Arithmetic operators, relational operators. Logical operators, assignment operators, increment and decrement operators, conditional operators, bitwise operators, special operators, Hierarchy of operations.

UNIT – II

(12 Hours)

Input and output statements, reading a character: getchar(), writing a character: putchar(), formatted and unformatted i/o statements. **Control structures:** Branching: if, if-else, nested if, else-if ladder, switch. **Looping:** while, do-while and for loop, nested loops. **Arrays:** Introduction, single dimensional array, two-dimensional arrays, initializing 2-d arrays, multidimensional arrays. **Operations on arrays:** traversal, insertion and deletion.

UNIT – III

(12 Hours)

Handling of character strings: Declaring & initializing string variables, reading strings from terminal, writing strings to screen, Arithmetic operations on characters, putting strings together, comparison of two strings, string handling functions. **User defined functions:** Need for user defined functions, Declaring, defining and calling C functions return values & their types, **Categories of functions:** With/without arguments, with/without return values, recursion, and functions with arrays, the scope, visibility & lifetime of variables (Storage classes).

UNIT - IV

(12 Hours)

Structures: Definition and declaration of a structure, assigning and accessing the members of a structure, structure initialization, structure elements in memory, comparison of structure variables, structure with in the structure, array within structures. **Unions:** Definition and declaration, accessing the members of a union. Comparison of structure and union. **Pointers:** Introduction to pointers, advantages of pointers, declaration of pointer variable, pointer expressions, pointers and functions: call by value and call by reference. **The Pre-processor:** Macro substitution and file inclusion. **Files:** Definition, types of files. Creating text file. Modes of opening a file, formatted and unformatted I/O

Texts Books:

1. “Let us C”,Yashavant P. Kanetkar,
2. “Programming in ANSI C”, E. Balaguruswamy,Tata Mc.Graw-Hill

Practical 1 (BSCSEMB 132)

Practical-1	BSCSEMB 132	36 hours
Practical/Week: 3 Hrs Credits: 1	C Programming Lab	I.A: 10 Exam: 40

Lab Programs

1. Write a C program to find area and circumference of the circle.
2. Write a menu driven C program to find
 - i) Reverse of a number (ii) Sum of integers of given number
3. Write a C program to find the largest and smallest number among three numbers.
4. Write a C Program to generate the prime numbers between two given integers.
5. Write a C program to find sum and product of two matrix.
6. Write a C program to transpose a matrix of order $N \times M$ and check whether it is symmetric or not.
7. Write a C program to swap two numbers using
 - i) Call by value ii) Call by reference.
8. Write a recursive function to generate the n th Fibonacci number and use this function in the main program to display the first n Fibonacci numbers.
9. Write a function to find the GCD of two integers and use this function in the main program to find the LCM of two integers.
10. Write a program to print minimum and maximum elements in the 1-D array.
11. Write a C program to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of five account holders.
12. Write a C program to find total marks of individual student and average marks for 10 students using structures.

13. Write a C program to create structure called traveller and members of structure are train no, coach no, seat no, source ,destination , gender, age, name and departure date.
14. Write a program to illustrate passing an entire structure to a function.

Scheme of Practical Examination for I Semester

Details	Marks
Problem solving and coding	15
Compiling the code and debugging	08
Execution and testing	07
Record	08
Viva	02
Total	40

Introduction to Arduino (BSCSEMB 181)
(Credits: Theory-02, Practicals-01)
Theory Lectures 48

Unit- I

(12 Hours)

Interfacing to sensors: Sensors- Definition, Types. Interfacing arduino to different sensors- light sensor, temperature sensor, humidity sensor, pressure sensor sound sensor, distance ranging sensor, water/detector sensor, smoke, gas, alcohol sensor, ultrasonic range finder

Unit -II

(12 Hours)

Displays: Basics of LED's and LCD's. Interfacing arduino to LED's- blinking single LED, blinking multiple LED's, 7 segment display , traffic light ,LED flashes ,LED dot matrix ,pulsating lamp. Interfacing to LCD's- Basic LCD control, LCD temperature control, display a message on LCD screen, scrolling of text Touch screens, Reading and writing to SD card

Unit III

(12 Hours)

Motor control: DC motors- Speed control, spin direction control. Servo motors- Speed control, direction control, Steppers and Robot's

Unit –IV

(12 Hours)

Communication over Ethernet: Ethernet shield, internet weather, display, e-mail alert system, twitterbot, RSS weather reader.

Texts Books:

1. "Beginning Arduino", Michal Mc Roberts, Second Edition
2. Michal Mc Roberts "Beginning Arduino" Second Edition, Technology in Action
3. Massimo Banzi, "Getting started with Arduino" 2nd Edition, Orelly 2011

Practical 2 (BSCSEMB 182)

Practical-1	BSCSEMB 182	36 hours
Practical/Week: 3 Hrs Credits: 1	Arduino Interfacing	I.A: 10 Exam: 40

PART A

1. Blinking a LED
2. Traffic signal indication (using 3 LED)
3. 8 bit binary counter
4. Basic LCD control
5. Servo control

PART B

Temperature indicator using Arduino

Scheme of Practical Examination for I Semester

SL.NO	Details	Marks	Total
1. PART A	Problem solving and coding	08	16
	Compiling the code and debugging	04	
	Execution and testing	04	
2. PART B	Demonstration	10	16
	Viva	06	
	Record	08	08
	Total	40	40

Embedded system for Daily Life
(BSCEMB 133)
(Credits: 01)
Total: 24 Lectures

Unit I

(8 Hours)

Introduction to embedded systems, embedded computer, Examples of embedded systems-digital camera, automotive embedded system, home security system, automatic washing machine, personal digital assistant, Industrial robots, Automated teller machine, calculator.

Unit II

(8 Hours)

Embedded system in biomedical field- Preventive care through biomedical sensors, Telemedicine, Biomedical sensors, Pacemakers, Glucose monitoring, Fitness trackers, clinical care through embedded system, smart hospital beds, clinical monitoring, Remote patient monitoring

Unit III

(8 Hours)

Embedded system in Defence - Intelligence gathering operations, embedded computing, cyber security, vehicle electronics, Futures of embedded system-Machine learning, UI design, board bring up, Data mining

Books :

- 1) "Embedded Systems Architecture A Comprehensive Guide for Engineers and Programmers", Tammy Noergaard, Elsevier, 2005
- 2) "Embedded Systems: A Contemporary Design Tool – James K. Peckol", John Wiley India Pvt. Ltd, 2008.
- 3) "Embedded system architecture, Programming and design", Raj Kamal, 2nd End, Tata Mc'Graw Hill.

Basic Understanding of Internet of Things
(BSCSEMB 183)
(Credits: 01)
Total: 24 Hours

Unit I

(8 Hours)

Evolution, M2M Vs IOT, People connecting with things, things connecting with things, application area's

Unit II

(8 Hours)

IOT architecture- Integrated application, Information processing, Network construction, Sensing and identification Sensors and actuators, Sensors available in the market Smart objects- Beaglebone black, Intel Galileo, Arduino Uno, Raspberry pi

Unit III

(8 Hours)

IOT communication technologies-2G/GSM, 3G, 4G, GPS, GPRS, WIFI, ZIGBEE, ANT, RFID NFC, Blue tooth, Ethernet, IOT network topology, IOT cloud, IOT protocols

TextBooks :

1. The internet of things - Sean Dodson and Rob van Kranenburg, 2009
2. Architecting the Internet of Things - Dieter Uckelmann, Mark Harrison, Florian Michahelles (auth.), Dieter Uckelmann, Mark Harrison, Florian Michahelles (eds.), Springer-Verlag Berlin Heidelberg, Year: 2011
3. Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud - Cuno Pfister, O'Reilly Media, Year: 2011
4. The Internet of Things: Key Applications and Protocols - Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley, 2012