UNIVERSITY OF MUMBAI

Syllabus for the T.Y.B.Sc.
Program: B.Sc.
Course: Applied component
Computer Science

(Credit Based Semester and Grading System for the academic year 2017–2018)

T.Y.B.Sc. Applied Component Computer Science Syllabus
Credit Based and Grading System
To be implemented for the Academic year 2017-2018

SEMESTER V

Theory

USACCS501	Microprocessor & C++ Programming		No of Credits	Lectures/ Week
Units	I	8085 Microprocessor	2	4
	II	8085 Instruction Set		
	III	Introduction to Computers and C++ Programming		
	IV	Functions, Arrays and pointers		

Practicals

USACCS5P1	Microprocessor & C++ Programming	2	4

SEMESTER VI

Theory

USACCS501	PC Hardware & C++ Programming		No of Credits	Lectures/ Week
Units	I	PC Hardware I	2	4
	II	PC Hardware II		
	III	C++ Programming I		
	IV	C++ Programming II		

Practicals

USACC6P1	PC Hardware & C++ Programming	2	4

The revised syllabus under the credit based grading system in the subject of Computer Science (Applied Component) for Third Year B.Sc. Physics (Single/Twin major subject) **will be implemented for the academic Year 2017-18.**

The scheme of examination in the subject of Computer Science (Applied Component) will be as follows:

Semester V & VI: Theory

Course Code: USACCS501 & USACS601

(A) Internal Examination: 25 marks

Sr. No	Particulars	Marks
1.	One periodical class test	20
2.	Active participation in routine class instructional deliveries and overall conduct as a responsible learner, mannerism and articulation and exhibit of leadership qualities in organizing related academic activities	05

(B) External Examination : 75 marks

- Duration of each Theory paper will be of **two and half hours.**
- Each theory paper shall consist of **five questions**, **one** from each unit and the **fifth question** will be from all the units. All questions are compulsory and will have internal choice.

SEMESTER V

Theory: Course I : Microprocessor & C++ Programming

USAC CS501	**I**	**8085 Microprocessor** 1. Logic devices for interfacing: Tri state devices, Buffers, Bus organized structure, Encoder, Decoder, Latch. 2. Features of Intel 8085 and Pin diagram of 8085 3. 8085 CPU Architecture and its operations • Arithmetic and Logical Group • ALU, Accumulator, Temporary Register, Flag Register (PSW) Register Group. • Temporary Registers (W and Z), General purpose Registers, Special purpose Registers • Interrupt Control • Serial I/O Control Group • Instruction Register, Decoder and Control Group • Instruction Register, Instruction Decoder, Timing and Control • Oscillator circuit, Reset circuit 4. Microprocessor initiated operations and bus organization, memory		

	II	**8085 Instruction Set** 1. **Addressing Modes :** Immediate Addressing, Register Addressing, Direct Addressing, Indirect Addressing, Implied Addressing or Inherent Addressing. 2. **Classification of Instruction Set :** Data Transfer Group, Arithmetic Group, Logical Group, Branching Group, Stack and Machine Control Group Notations used in Instructions and Opcode • **Data Transfer Group:** MOV R_d, Rs; MOV R, M or MOV M,R; MVI R, Data; MVI M, Data; LXI Rp, Data 16 bit; LDA Address; STA Address, LHLD, SHLD LDAX, STAX, XCHG, IN, OUT • **Arithmetic Operation Group:** ADD R; ADD M; ADC M; ADI Data; ACI Data; SUB R; SUB M; SBB R; SUI Data; DAA, INR R; INR M; DCR M; INX Rp; DCX Rp • **Logical Group:** CMP R, CMP M, CMA, XRA, XRI, STC, ANA, ANI,RLC, RRC, RAL, RAR • **Branch Group:** JMP, CALL, RET, RST N 3. Stack operations.		

	III	**Introduction to Computers and Programming:** Programs and programming languages, the programming process, Procedural and object oriented programming **TG: Chapter 1.3 to 1.7** **Introduction to C++:** The parts of a C++ program, The cout object, preprocessor directive (#include), variables and constants, Identifiers and rules for naming identifiers, Data types(integer, char, floating point, bool), variable assignment and initialization, scope of a variable, Arithmetic operators, comments. **TG: Chapter 2.1 to 2.14 [exclude 2.10]** **Expressions and Interactivity:** The cin object, entering multiple values, reading strings, mathematical expressions, operator precedence and associativity, type coercion, overflow and underflow, typecast operator, #define directive, multiple and combined assignment, formatting input and output, precision, mathematical library functions. **TG: Chapter 3.1 to 3.11** **Making Decisions:** Relational operators, if statement, flags, concept of compound statement, if/else statement, if/else if statement, trailing else, nested if statements, logical operators, validating user input, scope of a variable, comparing strings, conditional operator, switch statement. **TG: Chapter 4.1 to 1.16** **Looping:** Increment and decrement operators, while loop, sentinels, do-while loop, for loop, nested loops, break and continue statement.		
	IV	**Functions:** need for functions, defining and calling functions, function prototypes, sending information into a function (parameter passing), changing the value of the parameter, the return statement, returning a value from a function, local and global variables, static local variables, default arguments to a function, reference arguments, overloaded functions. **TG: Chapter 6.1 to 6.5 and 6.7 to 6.14** **Arrays:** Concept of arrays, accessing array elements, array initialization, processing array contents, copying and printing contents of an array, arrays as function arguments, two-dimensional arrays, arrays of strings. **TG: Chapter 7.1 to 7.5 and 7.8 to 7.11** **Pointers:** concept of a pointer, pointer variables, relationship between arrays and pointers, pointer arithmetic, Initializing pointers, comparing pointers, pointers as function parameters, dynamic memory allocation. **TG: Chapter 9.1 to 9.8**		

References:

For units I and II

VB Vibhute and Borole "8085 microprocessors", Tech-media

RG Ramesh Gaonkar "Microprocessor Architecture Programming and Applications with the 8085" (RG) 5th edition Penram

For Units III and IV

TG: Tony Gaddis "Programming in C++" 3rd Edition

Additional References:

1. Garry Bronson
2. Schaum series "Programming in C++"
3. Robert Lafore
4. H. Schildt
5. Cohoon & Davidson "C++ Program Design"
6. Tanennbaum et. al. "Data Structures in C++" (Prentice Hall)

(In addition to these books internet web-sites can be used wherever necessary.)

Practicals

USACCS5P1	**Group A: Microprocessor experiments: Any four** • ISR program(use VI key) • Addition and subtraction of two 8 bit numbers with carry and borrow • Sum of n numbers (n <= 10). Find smallest /greatest number • Transfer of memory block i) overlapping and ii) not overlapping • Multiplication of two positive numbers with product greater than 255. **Note:** Observation of registers by single stepping is expected. **Group B: C++ Programming Exercises:(Perform minimum 1 experiment from each B1 to B4)** **B-1 : Control structures:** 1. Temperature Conversion (Page 151 GB) 2. Triangle classification problem 3. A function calculator (Rational expression evaluator) (Page 125 RL) 4. Binary, Hex, Octal equivalents of decimal numbers in range 1 through 256 (page 154 DD) B**-2 : Functions:**		

	5. Use functions: a) To find if an integer is a perfect number & b) Print all perfect numbers in the range 1 to 1000 (page 232 DD) 6. Use functions: a) To find if a given integer is a prime or not b) Print all prime numbers between 1 and 500 (page 232 DD) 7. Use functions: To find GCD of two integers (page 232 DD) **B-3 Arrays:** 8. Mean, Variation and Deviance of a set of numbers (page 299 GB) 9. Linear Search / Binary Search 10. Selection Sort / Bubble Sort / Insertion Sort **B-4 String Manipulation:** 11. a) To find if a given string is a palindrome or not b) Reversing a string (Print a string backwards) (page 303 DD) 12. Use of string-compare & string-copy 13. To arrange names alphabetically		

Demonstration Experiments: (Any two)

- Microprocessor 8085 timing diagram
- Interfacing through 8255
- Microprocessor simulation on PC using 8085 simulator
- VB program demo
- Graphics with C++

Practical Examination:

1. Practical I Group A (40 marks) – Microprocessor
   Group B (40 Marks) – Structured C++ Programming
2. **Total eighty Marks (3 hours)**

Note: i) Algorithms, Flowchart optional. Printout of source code and output is compulsory.
ii) For both groups, there is no time differentiation between group A and B
iii) Internet facility is to be made available to students during practical whenever needed

There will not be any internal examination for practical. The External examination will be conducted as per the following scheme by the respective colleges and the marks will be forwarded to the University:

Sr. No	Particulars of External Practical Examination	Marks
1	Laboratory Work	80
2	Journal	10
3	Viva	10
	TOTAL	100

Total Marks in each semester:

- Duration of Practical paper will be of 3 Hours (Group A and Group B).
- A certified Journal must contain a minimum of **EIGHT** Experiments in each semester. At least four experiments from each group A and B as mentioned in the syllabus should be performed and reported in journal.
- Every candidate will be required to perform two experiments (one from group A and group B) at the semester end practical examination.
- A candidate will be allowed to appear for the Practical Examination only if the candidate submits his/her certified Journal or a certificate from the Head of the Department of Physics stating that the candidate has completed the practical Course of Electronic Instrumentation of the respective semester as per requirements.
- At least one demonstration experiment is to be reported in journal. Viva will be based on complete practical course syllabus and demo experiment reported.

SEMESTER VI

Theory: Course II : PC Hardware & C++ Programming

USAC CS602	**I**	**PC Hardware I** • Evolution of computers, classification, computer system, • Computer organization and architecture-CPU, internal communication, machine cycle, buses, instruction set. • Memory and storage systems-memory representation, RAM, ROM, magnetic storage, optical storage, solid state storage, • Peripheral devices- input and output devices. • Basic idea of number systems: integers, real numbers, floating point representation and binary arithmetic. Computer codes • Computer software, types, operating systems, MS-WORD, MS-EXCEL, ACCESS, POWER POINT , PROGRAMMING LANGUAGES • Data communication and networking, network topologies and benefits, protocols	**2**	**4**
	II	**PC Hardware II** 1. Multimedia Devices: Color Monitor, Sound card, Digital cameras, MP3 player. 2. Interfacing peripheral devices with PC: Comparison of serial, parallel, USB and firewire ports for interfacing. 3. Familiarity with Internet, WWW and Web Search engines, email, protocols 4. Computer viruses: types and protection		
	III	**OOP-I:** **Object oriented terms:** object, class, data hiding, encapsulation, inheritance and polymorphism **TG: Chapter 1.3 to 1.7** **Website for Object oriented terms** **http://java.sun.com/docs/books/tutorial/java/concepts/** **Introduction to classes:** Introduction to class, access specifiers(private and public) defining member functions, instance of a class(object), need for private members, inline member functions. **TG: Chapter 13.1 to 13.8** **Object initialization and cleanup:** constructors, destructors, constructors that accept arguments, overloaded constructors, default constructor and destructor, arrays of objects **TG: Chapter 13.9 to 13.14**		

		More about classes: static members, friends of classes, member wise assignment, copy constructors. **TG: Chapter 14.1 to 14.4** **Operator Loading:** Overloading assignment operator, this pointer, Overloading Math operators, overloading relational operators. **TG: Chapter 14.5 [exclude >> and << operators]**		
	IV	**OOP-II** **Inheritance:** Basics of inheritance, types of inheritance, protected members and class access, constructors and destructors, Overriding base class functions. **Polymorphism and virtual member functions: C**oncept of polymorphism, abstract base class and pure virtual functions, base class pointers, classes derived from derived classes, Multiple inheritance (concept only). **TG: Chapter 15.1 to 15.9**		

References:
Units I and II

EB : E. Balagurusamy, "Fundamentals of Computers", 2009, TMH

WS : William Stallings, "Computer Organization and Architecture" 6th Edition Pearson Publication

Additional references:

- **MM** Mark Minassi "PC upgrade and maintenance" 10th edition BPB
- **TB** Thomas Bartee "Digital Computer Fundamentals" TMH
- **JA** Jean Andrews "Enhanced Guide to managing and maintaining your PC" Thomson Learning (Chapter 9 and 10) ,

Units III and IV: All topics are from the book Tony Gaddis "Programming in C++" 3rd Edition.
(In addition to these books internet web-sites can be used wherever necessary.)

Additional References:

1. Garry Bronson
2. Schaum series "Programming in C++"
3. Robert Lafore
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Practicals

USAC CS6P1	**Group A** All experiments are compulsory **A1** : MS Office Word and Excel – Computer generated report of a Physics experiment actually performed by the student in the T.Y.B.Sc. lab. (This should include formulae, diagram, data table, graph, results etc) **A2:** PowerPoint: Presentation of any one Physics topic from T.Y.B.Sc. syllabus to be brought on CD/storage device. **A4**: Linux shell commands • Logging in and out of Linux • **File system commands :** ls command with options, pwd, passwd, cd, ln, cat, mkdir, rmdir, chmod, cp, mv, rm • **General purpose utilities:** more , wc, cmp, diff, comm., date , who **Group B: Object Oriented Programming using C++** (Perform minimum 4 experiments from the list given below) ▪ Rectangle Class (page 494 GB) ▪ Complex class for performing arithmetic with complex numbers (page 449 DD) ▪ Class called Rational for addition, subtraction & multiplication (page 449 DD) ▪ Time Class (page 502 GB) / Date class ▪ Function overloading: Absolute value of integer, float, double ▪ Operator overloading – Unary operators prefix/postfix ▪ Operator overloading – Binary operators – Addition of distances (Robert Lafore) ▪ Rectangle to Polar Co-ordinate conversion & vice versa. (Robert Lafore – 2 Dimension) ▪ Functionality of INT (refer Robert Lafore) ▪ Inheritance problems (Garry Bronson – Base class circle, Derived class – cylinder) ▪ Quadratic equation using Object Oriented techniques ▪ Traffic lights (ref. Garry Bronson) ▪ Polymorphism and Virtual function problems. (Garry Bronson)	**2**	**4**

Demonstration Experiments: (Any one)

- Interfacing PC with real world using parallel port. Linkage with temperature , light, EM relays, stepper motor, D.C. motor, solenoid, seven segment display ,etc.
- Installation of device drivers (e.g. Web Cam., joystick, mouse…)
- Internet usage (Physics search/Technical literature)
- VB program demo
- Graphics with C++

Ref: GB: Garry Bronson
DD: Deital & Deital
RL: Robert Lafore

Practical Examination:

Practical I

Group A (40 marks) – PC hardware

Group B (40 Marks) – OOP using C++

Note: i) Algorithms ,Flowchart optional. Printout of source code and output is compulsory.
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