

University of North Bengal (NBU)



Syllabus for MCA Bridge Course Under CBCS

**Department of Computer Science and Application
University of North Bengal**
Raja Rammohunpur, PO-N.B.U., Dist-Darjeeling, West Bengal, Pin-734013, India

(To be implemented from Session 2022-23)

General Information regarding MOOCs/ NPTEL/ SWAYAM/Open Courses

Ministry of Education, Government of India, New Delhi has developed one of the world's largest SWAYAM-MOOCs Platform where several hundreds of courses have been hosted for the benefits of the aspiring students which are available under SWAYAM/NPTEL online courses together. As advised by Ministry of Education, students, to a large extent, should be motivated for using online education through SWAYAM Platform and SWAYAM PRABHA courses and allowed credits up to 20% of the total courses being offered in a particular program in a Semester. The institutions may kindly look at the curriculum and find the equivalent courses in SWAYAM for all the courses i.e. from first year to final year. The institutes may also find if there are any other equivalent courses which can be taken through SWAYAM and decision may be taken accordingly at the university level as per the Credit Framework Regulations issued by UGC as well as AICTE. Universities/Colleges may recognize the credits of technical courses which are taken up by the students according to the UGC guidelines.

Keeping the above in view, students are given choices in core and other papers to select and complete from SWAYAM/NPTEL platform in consultation with the Departmental SWAYAM Coordinator.

Thus, any equivalent or related open course can be taken by any student from NPTEL or SWAYAM that is not taken by the student in the classroom after prior approval from the SWAYAM Coordinator in due time. Credit will be appropriated proportionately if there is any mismatch as per the syllabus. Students are advised to consult the SWAYAM Coordinator prior to registration for such course to get the same considered for his/her results. In case of delay of results from the concerned Course Provider, the result of the concerned student in a particular semester will be issued only after receiving the certificate issued by the Course Provider. However, provisional/ incomplete results may be declared to be updated later on.

As per the corresponding theory paper chosen, laboratory assignments will be given by the concerned teacher(s). In case of no separate lab marks from open/MOOCs course that includes laboratory as integrated part of the course, student may take the laboratory course if available in the department. Else, proportionate marks as decided by the SWAYAM Coordinator will be assigned while preparing the result in case of such laboratory course.

Proposed Syllabus (Structure) for Two Semester (Full Time) MCA Bridge Course

Outline of Choice Based Credit System:

1. **Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.
2. **Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the student's proficiency/skill is called an Elective Course.
 - 2.1. **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
 - 2.2. **Dissertation/Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project. Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. *A Project/Dissertation work may be given in lieu of a discipline specific elective paper.*
 - 2.3. **Generic Elective (GE) Course:** An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective.
- P.S.:** A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.
3. **Ability Enhancement Courses (AEC):** The Ability Enhancement (AE) Courses may be of two kinds: Ability Enhancement Compulsory Courses (AECC) and Skill Enhancement Courses (SEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement;
 - i. Environmental Science and
 - ii. English/MIL Communication.

These are mandatory for all disciplines. SEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

 - 3.1. **Ability Enhancement Compulsory Courses (AECC):** Environmental Science, English Communication/MIL Communication.
 - 3.2. **Skill Enhancement Courses (SEC):** These courses may be chosen from a pool of courses

CBCS STRUCTURE (w.e.f. 2022) of North Bengal University

DEPARTMENT: Department of Computer Science and Application		PROGRAMME NAME: MCA Bridge Course		
SEMESTER I				
Course Type	Choice	Course Title	Course credit	Total Credit
Core	None	1. Digital Systems and Microprocessors 2. Computer Fundamentals and Programming in C 3. Digital and Microprocessor Interfacing Lab	2 2 1	5
SEMESTER II				
Core	None	1. Introduction to Web Design 2. Numerical and Statistical Computing 3. Web Design Lab	2 2 1	5

designed to provide value-based and/or skill-based knowledge.

Year	Semester	Course Type	Course Code	Paper Title	Credit	Periods/Week	ESE	Continuing Evaluation	
								CE	Nature
1 st Year	I	CORE	BCC-101	Digital Systems and Microprocessors	2	2	40	10	Class Test
		CORE	BCC-102	Computer Fundamentals and Programming in C	2	2	40	10	Class Test
		CORE	BCCP-103	Digital and Microprocessor Interfacing Lab	1	2	40	10	Laboratory Assignment
					5	6	120	30	150
	II	CORE	BCC-201	Introduction to Web Design	2	2	40	10	Class Test
		CORE	BCC-202	Numerical and Statistical Computing	2	2	40	10	Class Test
		CORE	BCCP-203	Web Design Lab	1	2	40	10	Laboratory Assignment
					5	6	120	30	150
	Total					10	12	240	60
NB:	<ul style="list-style-type: none"> The allotment of electives shall depend on the availability of teachers. One 'Period' is of 1 Hr. duration. 1 Credit ≈ 1 hr Lecture/week or 2 hrs practical/week In addition to specific GEs, the CC or DSE courses of 4 credits of odd and even semesters may also be offered as GE for students from other departments in corresponding odd and even semesters only. Credit of SWAYAM courses will be considered equivalently as specified in the syllabus. GE to be offered to a candidate on consultation with the BoS. Nature of Continuing Evaluation may be Class Test/Assignments/Viva Voice and/or other means as followed by individual teachers. 								
Abbreviations	<ul style="list-style-type: none"> CC: Core Course DSE: Discipline Specific Electives DE: Discipline Electives SEC: Skill Enhancement Courses SE: Skill Enhancement SEP: Skill Enhancement Practical 			<ul style="list-style-type: none"> CP: Core Practical DSEP: Discipline Specific Electives Practical DEP: Discipline Electives Practical AECC: Ability Enhancement Compulsory Courses DP: Discipline Specific Project EIS: Educational / Industrial Tour/Seminar 					

Detailed Syllabus of Compulsory Papers

Year 1: Semester 1

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BCC-101: Digital Systems and Microprocessors

Electronic Systems: Introduction to Analog and Digital Systems, Comparison between Analog and Digital Systems, advantages of digital systems

Number systems: Foundation of number systems, Binary, octal, and hexadecimal number systems, Conversion from one Number System to another, r's and (r-1)'s complements, Arithmetic operations on Binary numbers, Representation of negative numbers, Signed Binary numbers, fixed and floating point representations;

Binary codes: Binary Coded Decimal (8421 BCD, Excess-3 BCD) , Addition of BCD numbers, Gray code, Error detecting and correction codes, Seven-segment display code, Alphanumeric codes (ASCII, EBCDIC, ISCII, UNICODE);

Boolean algebra and Logic Gates: Boolean Algebra: Laws, Postulates and theorems, logic functions, Writing Boolean functions from truth table, different logic gates and truth tables, realizing logical expressions using different logic gates and comparing their performance, logic diagrams, minimization of Boolean expressions using different techniques; converting circuits to universal logic, Sum of Product and Product of Sum, Universal logic operations

Logic Families: Classification and characteristics, Bipolar transistors characteristic and families (RTL, DTL, I²L, HTL, TTL, ECL), MOS families (MOSFET, CMOS, BiCMOS); Tri state logic

Design of Combinational Circuits: Designing different combinational circuits i.e. Half-adder, Full-adder, Sequential adder, binary Parallel adder, Carry-Look-Ahead adder, Adder, Subtractor, multiplication, code conversion, Decoders and Encoders, Magnitude Comparator, Multiplexer, Demultiplexers, Parity generator and checker, Hardware aspects related to logic design: delays and hazards;

Design of Sequential Circuits: Flip-Flops and their types, Conversion of flip-flops, excitation tables, practical clocking aspects concerning flip-flops, timing and triggering; Registers and their types, Counters and their types, A/D and D/A converters, Memory Devices and their types, PLAs, PLDs and implementation of circuits using PLDs; *Control logic Design*-- Hard-wired control, micro program sequencer

Microprocessors: Microprocessor, microcontrollers, digital signal processors, processor evolution, microprocessor architecture and its operations, memory input/output; addressing modes; instruction set, format and classification; arithmetic and data transfer instructions; subroutine call and return instruction, restart as software instruction; logic and branch operation, looping, counting and indexing, timings and operation status; stack, parallel input/output, interfacing devices, memory interfacing, 8085/8086 based microcomputer system; 8087 coprocessor, 8051 and 8096 microcontroller; 8255 programmable peripheral interface, 8253 programmable timer, 8259 programmable interrupt controller, direct memory access and 8257 DMA controller

Assembly Language Programming: Assembler, assembly language and instructions, assembler directives (pseudo ops), ALP

References:

1. Digital Design: M. Morris Mano and Michael D. Ciletti, Pearson Education.
2. Digital Logic and Computer Design: Morris Mano, Prentice Hall of India.
3. Modern Digital Electronics: R.P. Jain, Tata McGraw-Hill.
4. Digital Principles and Applications: Malvino and Leach, TMH
5. Digital Circuits and Design: S. Salivahanan and S. Arivazhagan, Vikas Publication.
6. Digital Integrated Electronics: Taub and Schilling, McHill
7. Engineering Digital Design: R. F. Tinder, Academic Press, Harcourt India Pvt. Ltd.

8. Introduction to Logic design: A. B. Marcovitz, Tata –McGraw-Hill Edition.
9. Fundamentals of Digital Logic with VHDL Design: B. Vranesic, Tata-Mc-Graw-Hill
10. An introduction to Digital Computer Design: Rajaraman and Radhakrishanan, PHI.
11. Microprocessor and Interfacing: D. V. Hall, TMH
12. The Intel Microprocessors: Barry B. Bray, PHI
13. Jaydeep Chakravorty, Digital Electronics and Logic Design, Universities Press

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BCC-102: Computer Fundamentals and Programming in C

Introduction to Computers and C: Introduction to computer, history and type of computer, Generation of Computers and Computer Languages, Computer Systems, Basic block Diagram, processors and their types, von-Neumann Architecture, Hardware, Firmware, I/O Devices, memory and their types, Storage classifications, features and use of computers, other computer peripheral devices, Language translators. History of C, overview of procedural programming, introduction to algorithm & flowcharts.

Understanding Compilation and Execution in C: Using main() function, Compiling and Executing Simple Programs in C.

Data Types, Variables, Constants, Operators and Basic I/O: Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Data Types, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar etc), Formatted and Console I/O (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h etc).

Expressions, Conditional Statements and Iterative Statements: Simple Expressions in C (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions, Conditional Statements (if construct, switch-case construct), Understanding syntax and utility of Iterative Statements (while, do-while, and for loops), Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)

Understanding Functions: Utility of functions, Call by Value, Call by Reference, Functions returning value, Void functions, Inline Functions, Return data type of functions, Functions parameters, Differentiating between Declaration and Definition of Functions, Command Line Arguments/Parameters in Functions, Functions with variable number of Arguments.

Implementation of Arrays and Strings: Creating and Using One Dimensional Arrays (Declaring and Defining an Array, Initializing an Array, Accessing individual elements in an Array, Manipulating array elements using loops), Use Various types of arrays (integer, float and character arrays / Strings) Two-dimensional Arrays (Declaring, Defining and Initializing Two Dimensional Array, Working with Rows and Columns), Introduction to Multi-dimensional arrays

User-defined Data Types (Structures and Unions): Understanding utility of structures and unions, Declaring, initializing and using simple structures and unions, Manipulating individual members of structures and unions, Array of Structures, Individual data members as structures, Passing and returning structures from functions, Structure with union as members, Union with structures as members.

Pointers and References in C: Understanding a Pointer Variable, Simple use of Pointers (Declaring and Dereferencing Pointers to simple variables), Pointers to Pointers, Pointers to structures, Problems with Pointers, Passing pointers as function arguments, Returning a pointer from a function, using arrays as pointers, Passing arrays to functions. Pointers vs. References, Declaring and initializing references, Using references as function arguments and function return values

Memory Allocation in C: Differentiating between static and dynamic memory allocation, use of malloc, calloc and free functions, use of new and delete operators, storage of variables in static and dynamic memory allocation

File I/O: Opening and closing a file, Reading and writing Text Files, Using put(), get(), read() and write() functions, Random access in files

Preprocessor Directives: Understanding the Preprocessor Directives (#include, #define, #error, #if, #else, #elif, #endif, #ifdef, #ifndef and #undef), Macros

Suggested Readings

1. The C Programming Language ANSI C Version", Kernighan & Ritchie, Prentice Hall Software Series
2. ANSI C - Made Easy, Herbert Schildt, Osborne McGraw-Hill
3. Learning to Program in C, N. Kantaris, Babani
4. C - The Complete Reference, Herbert Schildt, Osborne McGraw-Hill
5. Programming in C, Reema Thareja, Oxford University Press
6. A First Course in Programming With C, T. Jeyapoovan, Vikas Publishing House
7. Let Us C, Yashavant P. Kanetkar, BPB Publications

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BCCP-101: Digital and Microprocessor Interfacing Lab

- A. Students must learn designing small digital circuits using chips and breadboard
- B. Interfacing the microprocessor kit with PC, writing and assembling language programs
Programs to be assigned by the concerned teacher.

BCC-201: Introduction to Web Design

Internet and Web: Introduction and Evolution of Internet, WWW, Understanding Browsers, Internet protocols and applications i.e. FTP, Telnet, Email, Chat etc.; Semantic Web Information System, Quality Evaluation and Web Engineering and Application Development, Web Design and Development issues, challenges, Web Design Methods; Web Protocols: TCP, IP and HTTP, SMTP, POP3, FTP; Measuring and Evaluating Web Application

Static Web Design with HTML: Introduction, Evolution, Features of HTML, Filenames in HTML, Tools required, Tags and their Types, Attributes, Comments, Structures of HTML tag, Rules for writing a HTML program, starting a HTML document i.e. How to open Notepad, How to open HTML page, Editing the HTML program, Building web pages with different HTML tags, Frames, forms etc, *HTML Editors and Tools*- Use of different HTML editors and tools like Microsoft Front Page, Dreamweaver etc., Designing Web Application with Web ML and Web Ratio; *Graphical and Animation Tools*- Use of Different graphical and animation tools like Abode Photoshop, Gif Animator, Macromedia flash etc.

Introduction to DHTML, ITS and XML: Introduction, Creating interactive and dynamic web pages, Cascading Style Sheets, Types of Style Sheets (Inline, Internal and External), Class Selector, ID Selector, Absolute Relative Positioning, Inline menu, DIV + ITS Layout Design, PSD to ITS Conversion , transition from HTML to XML, structuring with schema DTD, XML schemas, building blocks of XML document; creating elements, attributes and entities; Validating XML, XML Schema, XML Processing DOM, SAX, Presental XSL, Transformation XSLT, XPath, XLink, XQuery, XML Security and meta framework, XML signature, XML Encryption, SAML, XKMS, AJAX, RSS, JSON, WS-Security, RDF, semantic Web service, Transforming XML with XSL, Integrating XML with database

Client side scripting: JavaScript, JavaScript Objects, DOM, Java Script, ASP.NET, VB Script

Server Side Scripting: Overview of servlets, Servlet API, Servlet life cycle, Servlet based Web Application, Servlet configuration, Running Servlet with database connectivity, Servlet support for cookies, Session tracking; BasiIT of ASP, JSP, PHP, ASP.NET, Comparison of ASP, PHP and JSP technologies

Hosting Website & Security: Hosting a Website, Web Security and issues, Firewalls, cyber laws

Database Integration: Designing the Databases and linking the web pages with the database using PHP

References:

1. A Navarro, Mastering XML, BPB
2. Achyut S Godbole and Atul Kahate, Web Technologies, TMH
3. Ann Navarro, Effective Web Design, BPB publications.
4. C. Xavier, Web Technology and Design, TMH
5. David A Chappell, Tyler Jewell, Java Web Services
6. David Busch, Cascating Style Sheets complete, McGrawHill
7. Freunk p.coyle, XML, web Services and the Data Revolution, Pearson, 2002
8. Ivan Bayross, Sharanam Shah, PHP 5.1 for Beginners (Book/CD-Rom), 2006
9. Ivan Bayross, Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl, CGI, BPB
10. P. J. Deitel and H. M. Deitel, Internet and World Wide Web: How to Program, 4th Ed.,
11. Patrick Naughton and Herbertz Schildt, Java-2 The complete Reference, TMH
12. Raj Kamal, Internet and Web Technologies, TMH
13. Robert W. Sebesta, Programming with World Wide Web, Pearson Education, 2008
14. Sandeep Chatterjee and James Webber, Developing Enterprise web services: An Architect's Guide, PHI, 2004
15. Scott Robert Ladd, Dynamic HTML complete, McGrawHill

BCC-202: Numerical and Statistical Computing

Solution to Transcendental and Polynomial Equations: Iterative methods, bisection method, secant method, Newton-Raphson method, regula-falsi method, fixed point method, methods for finding complex roots.

Numerical Differentiation and Integration: Numerical Integration: Newton-Cotes formulae, trapezoidal rule, Simpson's rule, Gaussian quadrature; Numerical Solutions of Ordinary Differential Equations: Picard's and Taylor's series, Euler's and Runge-Kutta (RK), Predictor-correctors, Milne-Simpsons methods.

Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination method, Gauss Jacobi and Gauss Seidel iterative methods, pivoting, Ill Conditioned system of equations,

Interpolation: Polynomial interpolation, Newton's forward and backward formula, Central Difference Formulae: Gauss forward and backward formula, Sterling's, Bessel's, Everett's formula, Lagrange's Interpolation, Newton Divided difference formula, Hermit's Interpolation for unequal intervals.

Basic Statistics: Theory of sampling, Measures of central tendencies, Measures of dispersion, Frequency distributions, Moments, Correlation coefficient, Regression analysis, Time series and forecasting, Statistical Quality control methods- Factor analysis,.

Curve Fitting and Approximations: Method of least squares, fitting of straight lines, polynomials, exponential curves etc., Approximation of functions by Chebyshev polynomials.

Test of Significance: Chi-Square Test, t-test and F-test.

References:

1. E. Balaguruswamy, Numerical Methods, THM
2. John H. Mathews, Numerical Methods for Mathematics and Engineering, PHI
3. T. Veerarajan and T. Ramachandran, Theory and Problems in Numerical Methods, THM
4. N. Dutta, Computer Programming and Numerical Analysis, Universities Press
5. Rajaraman V., Computer Oriented Numerical Methods, PHI
6. Affi, A.A., Statistical Analysis: A Computer Oriented Approach, Academic Press, New York, 1979
7. Hogg. R. V. Et. Al., Introduction to Mathematical Statistics, American Publishing, New York. 1980
8. Jain, Iyengar and Jain, Numerical Methods for Scientific and Engineering Computations, New Age Int.
9. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 7th Ed., New Age International Publishers, 2007
10. Gupta S. P. and Kapoor, V. K., Fundamentals of Mathematical Statistics, Sultan Chand and Sons.
11. K. E. Atkinson, W. Han, Elementary Numerical Analysis, 3rd Ed., Wiley, 2003
12. B. Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, 2007

BCCP-201: Web Design Lab

Students are to practically implement the applications including the following and alike:

1. Web programming with HTML tags, ITS for styling, Page layout
2. Develop webpage using JavaScript for client side programming and HTML forms
3. Using The DOM and the JavaScript object models
4. Website optimization: crunching HTML, using ITS to replace HTML and light-weight graphiIT to speed up websites
5. Creating XML file with XML DTD and XML schema, SAX, XSL
6. Web site creation with PHP for server side programming for storing current date-time using cookies and for storing page views using sessions
7. Web application development using Servlet/ PHP/ JSP/ ASP.NET
8. Creation of XML file and validation using XML schema and generation of XML using tools.
9. Simple xml based applications using DOM, SAX and XSL.
10. Designing typical website for different types of organizations
