DEPARTMENT HANDBOOK

Bachelor of Science [B.Sc.]

in

COMPUTER SCIENCE

[2022 – 2026]

AFRICAN UNIVERSITY OF SCIENCE AND TECHNOLOGY

CONTENTS

1.0 INTRODUCTION TO AFRICAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (AUST)

Although situated in Nigeria, The African University of Science and Technology, Abuja (AUST-Abuja) was set up to be a pan-African university to serve all of sub-Saharan Africa. It is the first of a small group of institutions created to be part of a framework called the African Institute of Science and Technology (AIST), others are now to be found in Burkina Faso and Arusha, Tanzania. The AIST concept drew its inspiration from the highly successful Indian Institutes of Technology (IIT) and the Indian Institute of Science (IIS). AUST is a respected, not-for-profit world-class technological university, whose purpose is to train, and help retain in Africa, top-level scientists and engineers. The medium of instruction at AUST-Abuja is English. Special language courses are provided for non-English speakers to prepare them for participation in programs in English. The AUST-Abuja campus is located within the Abuja Technology Village (ATV), a planned cluster of leading research institutions and technology companies, located on a 1,000-hectare site where it occupies 240 hectares. The land was donated by the Government of Nigeria for this purpose. It is conveniently situated just 10 minutes from Abuja's city centre and 20 minutes from Nnamdi Azikiwe International Airport. AUST received accreditation from the Nigerian Universities Commission (NUC) in 2007 and received its first batch of students in 2008. Since then, true to the philosophy behind its establishment, as a pan-African institution to build science, engineering and technology capacity in all of sub-Saharan Africa, AUST has educated students from more than 26 African countries in East, West, Central and Southern Africa

In its short 16 years of teaching, research and innovation, AUST has already matured into a promising institution with a combination of Resident Faculty, over 40 full-time staff members, 80 visiting Faculty, world renowned specialists in their fields, brought in every year to teach and supervise research for over 160 MSc/PhD students in Computer Science, Materials Science and Engineering, Petroleum Engineering, Pure and Applied mathematics and Theoretical and Applied Physics. It is not surprising that AUST is already emerging as a noteworthy research university in the heart of Africa; the University has already become one of the very few African universities designated as a Center of Excellence by the World Bank, with a special focus on its programs in Material Science and Engineering and thus serves as the coordinating center for the region's Pan African Materials Institute (PAMI). Our groups in materials science and physics are developing the next generation of organic solar cells and light emitting devices. They are also developing the next generation of nanoparticles now being used in the detection and treatment of such medical conditions as cancer and cardiovascular disease. Similarly, our groups in petroleum engineering are working on using cutting-edge theoretical and computational tools to develop new tools for the oil and gas industry. These include theoretical and computational tools for flow assurance and reservoir management, as well as the introduction of nano-mechanics and fracture mechanics to the management of pipelines, reservoirs and offshore structures.

In the area of computer science, our DEVS team has won a number of top awards at International Conferences and professional events. The groups in computer science are also working on e-learning platforms and wireless technologies that are being integrated with mobile telecommunications. This is being done in an environment that has a 64-node multi-processor that has been used as the basis for the setting up of a high-performance computing (HPC) array. Our mathematics group has established itself as one of the leading groups in functional analysis. With its recent focus on fixed point theory and

equations of the Hammerstein type, they are solving problems at the frontiers of mathematics.

The fundamental objective of the African University of Science and Technology (AUST) is to educate the next generation of African scientists and engineers – providing them with the technical and leadership capacities to solve real African problems and contribute to the economic and social transformation of the continent. AUST will deliver a strong foundation in the fundamentals of mathematics and science; a deep understanding of the research frontiers; and an orientation towards entrepreneurship and service. AUST is committed to excellence in teaching, research and service. It is also motivated to build collaborative partnerships with for-profit and not-for-profit institutions to support the millennium goals for the development of the African Continent. The goal of the curriculum is to prepare students to become very high-level professionals who can play a transformational role in African industry/business and academia.

2.0 INTRODUCTION TO THE COMPUTER SCIENCE PROGRAMME

The discipline of Computer Science focuses on producing graduates who are ready to develop and maintain computer systems and quality software systems for organizations and businesses within the constraint of time, budget and other requirements. In addition, it also involves human computer interaction, artificial intelligence, data science that are harder to formalize than general computer science. The discipline therefore borrows and adapts from traditional engineering practice as well as from the field of project management.

2.1 Mission

The mission of the program is impacting the training of Computer Science to produce graduate suitable for job market, post-graduate work and capable of applying their knowledge and skill to solve complex social and technological problems across the globe.

2.2 Vision

To produce competent graduates that will compete with their counterpart in the development of Africa and the country at large.

2.3 Philosophy

The philosophy of this program is based on the belief that:

i. Education is an instrument for national development;
ii. Education foster the worth and development of the individual into a sound and effective citizen for the individual's sake, and for the general development of the society;
iii. Through provision of functional education, individuals can be fully integrated into the society;
iv. Our nation should compete with the international community in the field of information technology.

2.4 Aim and Objectives

The objectives of BSc Computer Science are:

i. Create in students the awareness of and enthusiasm for computer science and its capabilities.
ii. Involve the students in an intellectually stimulating and satisfying experience of learning and studying.
iii. Provide a broad and balanced foundation in computer science knowledge and practical skills.
iv. Develop in students through an education in computer science a range of transferable applicable skills of information technology to all aspects of human endeavours.
v. Generate in students an appreciation of the importance of computer in an industrial, economic, technological and social context.
vi. Provide students with knowledge and skills base for further studies in computer science or multi-disciplinary studies involving computer science.

2.5 Learning Outcome

- Regime of Subject Knowledge: Each institution providing degree programmes in Computer Science is free, within the context of university autonomy and academic freedom to decide on the content, nature and organization of its courses and modules. However, it is expected that all programmes will ensure that students are conversant with the core areas of computer science.
- Competencies and Skills: Students are expected to develop a wide range of different abilities, dynamism and skills. These may be divided into three categories, viz. Cognitive Abilities and Skills, Practical Skills, and General Skills.

- Behavioral Attitudes: General skills relating to non-subject specific competencies, communication, interpersonal, organization skills.

2.6. Attainment Levels

Graduates of Computer Science are expected to have the ability to apply knowledge and skills to solving theoretical and practical problems in Computer Science, development of relevant ICT for national development and societal needs.

2.7 Admission Requirements

2.7.1 Entry Requirement and Duration

The entry requirements are at least credit level passes in five subjects to include English Language, Mathematics/Further Mathematics, and any of Physics, Data Processing, Computer Science, plus two (2) other science subjects, at the Senior Secondary School Certificate or its equivalent.

2.7.1.1 Nigerian Students

The entry requirements shall be at least credit level passes in five subjects to include English Language, Mathematics/Further Mathematics, and any of Physics, Data Processing, Computer Science, plus two (2) other science subjects, at the Senior Secondary School Certificate or its equivalent. In addition, an acceptable pass in the Unified Tertiary Matriculation Examination (UTME) is required for admission into 100-level. Candidates are admitted into the degree programme in any of the following three ways:

- The University Tertiary Matriculation Examination (UTME)
- Direct Entry
- Inter-University Transfer

2.7.1.2 UTME Entry Mode

The minimum academic requirement is credit level passes in five subjects at O'Level in national Examination/Cambridge O'Level: Mathematics/ Further Mathematics, English Language and three (3) other Science subjects.

UTME SUBJECTS: Physics, Mathematics and Chemistry/Biology/Agric Science/Economics/Geography

2.7.1.3 Direct Entry Mode

- In addition to O'Level requirements stipulated above, applicants should possess at least two A'Level papers in Level in relevant subjects (Chemistry, Mathematics and Physics, Biology) may be considered for admission into 200-level.
- OND in relevant discipline with at least upper credit grade in addition to the five credit passes as stated above.
- HND in relevant discipline with at least upper credit in addition to five credit passes as stated above.
- Joint Universities Preliminary Examinations Board (JUPEB)/ Interim Joint Matriculation Board Examination (IJMBE) and AUST Foundation Program are also acceptable.

2.7.1.4 Foreign Students

The University proposes to admit foreign students through the options listed below and will comply with the admission policy into Nigerian Universities and JAMB:

- Scholastic Aptitude Test (SAT) – An international entrance exam for admission into Universities in the United States and American University abroad, which is conducted in over 130 countries.
- Any other internationally recognized University Entrance Exam, equivalent of the JAMB in Nigeria.
- Joint Universities Preliminary Examinations Board (JUPEB)/ Interim Joint Matriculation Board Examination (IJMBE) and AUST Foundation Program are also acceptable.

2.7.2 Duration

A student will not be allowed to exceed an additional 50 per cent of the duration of the programme if he fails to graduate within the minimum number of years.

2.7.2.1 UTME

Four (4) academic sessions or eight (8) semesters.

2.7.2.2 Direct Entry

Three (3) academic sessions or six (6) semesters. In general, no student will be allowed to exceed an additional 50% of the normal duration of the programme.

2.8 Graduation Requirements

To qualify for the 4-year Bachelor of Science (B.Sc.) degree award in the Computer Science programme, a student must pass the minimum number of credit units as shown in the Tables 1-3. This table is based on Minimum Academic Standards and guidelines of National Universities Commission (NUC).

2.8.1 Course Credit System

Students in department of computer science are expected to take a minimum of 160 credit units for the award of a Bachelor's degree in Computer Science. A minimum of 15 credit units and a maximum of twenty-four (24) credit units should be taken by each student per semester. Each of the courses in the programme is expected to be taught for a semester which will last for a minimum of fifteen (15) weeks. The teaching should be distributed into lectures, tutorials and workshops/studio practical.

2.8.2 Grading of Courses

The grading system provided by the University is an indicative policy for the calculation of grade point average (GPA). The grading system policy for students at AUST showing the letter grades, its corresponding grade point and the score range is shown below:

Table 1: Grading System at AUST

Grades on 4.0 Scale	Letter Grade	Score Out of 100
4.00	A	95 – 100
3.75	A-	89 – 94
3.25	B+	83 – 88
3.00	B	77 – 82
2.75	B-	71 – 76
2.25	C+	65 – 70
2.00	C	59 – 64
1.75	C-	53 – 58
1.00	D	48 – 52
0	F	0 – 47

2.8.3 Grade Point Average and Cumulative Grade Point Average

For the purpose of determining a student's standing at the end of every semester, the Grade Point Average (GPA) system shall be used. The GPA is computed by dividing the total number of Units x Grade Point (TUGP) by the total number of units (TNU) for all the courses taken in the semester. The Cumulative Grade Point Average (CGPA) over a period of semesters is calculated in the same manner as the GPA by using the grade points of all the courses taken during the period. Calculation of GPA or CGPA is shown in Table 2.

Table 2: GPA Calculation

Course	Units	Grade Point	Units x Grade Point (UGP)
C_1	U_1	GP_1	$U_1 \times GP_1$
C_2	U_2	GP_2	$U_2 \times GP_2$
-	-	-	-
-	-	-	-
C_i	U_i	GP_i	$U_i \times GP_i$
-	-	-	-
-	-	-	-
C_N	U_N	GP_N	$U_N \times GP_N$
TOTAL	TNU		TUGP

$$TNU = \sum_{i=1}^{N} U_i \qquad TUGP = \sum_{i=1}^{N} U_i * GP_i \qquad CGPA = \frac{TUGP}{TNU}$$

2.8.4 Degree Classifications

Classes of degree are to be awarded depending on the cumulative GPA obtained. The classes of degrees that may be awarded are First Class Honours, Second Class Honours (Upper Division), Second Class Honours (Lower Division) and Third Class Honours. Table 3 shows the degree classification.

Table 3: Degree Classification

CGPA	CLASS OF DEGREE
3.50 – 4.00	First Class Honours
2.50 – 3.49	Second Class Honours (Upper Division)
1.40 – 2.49	Second Class Honours (Lower Division)
0.50 – 1.39	Third Class Honours

2.8.5 Probation

Probation is a status granted to a student whose academic performance fall below an acceptable standard. A student whose Cumulative Grade Point Average is below 0.50 at the end of a particular year of study, earns a period of probation for one academic session.

2.8.6 Withdrawal

- A student shall be requested to withdraw from a programme if at the end of a probation period, the student still does not make satisfactory progress. Such student shall be at liberty to apply for a change of programme within the University.
- Subject to the conditions for withdrawal and probation, a student may be allowed to repeat the failed course Unit(s) at the next available opportunity, provided that the total number of credit units carried during that semester does not exceed 24, and the Grade Points earned at all attempts shall count towards the CGPA.

2.9 Evaluation

2.9.1 Techniques of Students Assessment

The evidence, on which the assessment of a student's achievement is based, will include the following:

- Formal examinations
- Laboratory Reports
- Problem Solving Exercises
- Oral Presentations
- Essay Assignments/Term Papers
- Collaborative Project Work
- Individual Project Work
- Report on External Placement (SIWES)
- External Examiners Report
- Surveys and Evaluations

2.9.2 External Examiner's System

External examiners shall be appointed once in a year particularly at the end of each session to moderate examination questions, review the scripts of the students, and provide an overview of the work of the students in all classes, particularly those in the final year. It shall be mandatory on the Chief Examiner to review the questions set by his colleagues before those questions are forwarded to the External Examiner in order to ensure that they reflect the coverage of the syllabi and the manner in which they were taught. The system also provides avenues for assessing comparability of programmes and the maintenance of minimum standards.

2.9.3 SIWES Rating and Assessment

The Nigerian Universities Commission (NUC) has mandated and approved Students Work Experience Programme (SWEP) and Students Industrial Work Experience Scheme (SIWES), for Nigerian Universities and other institutions of higher learning; for its students to undergo various training in their respective fields of studies due to lack of relevant facilities and machinery within the Nigerian Universities. Thus, mandatory for all students offering relevant courses in higher institutions to undergo the SWEP and SIWES programme at their assigned level and stipulated time. The exposure to a combination of field and office experience both in the public and private sectors and/or construction activities relevant to their individual disciplines. All students in the Chemistry discipline will be exposed to a period of compulsory, supervised SIWES in addition to Laboratories/Workshop/Practical/Studio Training as reflected in the individual programmes. Such training shall be undertaken in an approved establishment. A minimum period of a semester is considered to be adequate. The student is expected to submit a systematic log-book for assessment at the end of the training period. Students with unsatisfactory performance shall be required to repeat the training programme.

2.9.4 Students' Evaluation of Courses

At the end of every semester, students shall be given the opportunity to evaluate the courses taken in the semester based on the following criteria:

- relevance
- adequacy in terms of time and content coverage
- students understanding of the courses
- adequacy of lectures, tutorials and practical
- standards of continuous assessment and examinations

2.9.5 Maintenance of Curricula Relevance

The various curricula for the Pure and Industrial Chemistry should be reviewed from time to time as reflected in each individual programme. General review will be conducted every five (5) years, in full consultation with the relevant professional bodies.

2.9.6 Performance Evaluation Criteria

The general performance indices useful to accreditation assessors and for internal review terms are as specified in each individual programme, especially as these relate to the following: staff/student ratio, facilities such as laboratories, workshops, library/Information and Communication Technology (ICT), staff composition and minimum space requirements.

3.0 RESOURCES

3.1 Staffing

	ACADEMIC STAFF				SNR. TECH. STAFF	SNR. ADMIN. STAFF		JUNIOR STAFF	
	PROF.	READER/ ASSOC. PROF.	SNR. LECT.	LECT. 1 & BELOW		SEC.	NON-SEC.	TECH.	NON-TECH.
Core Staff on the ground for the programme	2	2		6	3	1	1	1	1
Staff available for the programme from other source (s)	2	4	2						
Total	4	6	2	6	3	1	1	1	1

Table 4: List of Existing Academic Staff for The Programme

S/N	NAME OF ACADEMIC STAFF	AREA OF SPECIALIZATION	DISCIPLINE	QUALIFICATION	RANK
1	Rajesh PRASAD	Operating system; Software Engineering	Computer science	PhD	Associate Professor and Head (FT)
2	Usman BELLO	Mathematical modelling	Mathematics	PhD	Assistant Professor (FT)
3	Amos DAVID	Data modeling; Big data; Information systems	Computer science	PhD	Professor (PT)
4	Ekpe OKORAFOR	Computer networks	Computer science	PhD	Associate Professor (PT)
5	Charles SAIDU	Artificial intelligence	Computer Science	MSc	Lecturer I (FT)
6	Saratu YUSUF	Artificial Intelligence	Computer Science	MSc	Lecturer II (FT)
7	Zaharaddeen SANI	Artificial Intelligence; Programming Languages	Computer Science	MSc	Lecturer II(FT)
8	Clement DAVID	Machine learning	Computer science	MSc	Lecturer II (FT)
9	Bunmi ALABI	Information system	Computer science	MSc	Lecturer II (FT)

10	Hamisu Ismail AHMED	Object oriented analysis and Design	Computer science	MSc	Assistant lecturer (FT)

FT – Full time PT – Part time

Table 5: List of Existing Non-Academic Staff for the Programme

S/N	NAME OF NON-ACADEMIC STAFF	AREA OF SPECIALIZATION	DISCIPLINE	QUALIFICATION	RANK
1	Abiodun Bidemi	Networking	ICT	BSc	System administrator
2	God-dey Chukwuemeka Onyele	Hardware and Troubleshooting	ICT	BSc	IT-Assistant
3	Kasiemobi Martins Offie	Programmer	ICT	BSc	Programmer
4	Paulina Jekeli	Information Security	Computer Science	BSc	Admin assistant

3.2 Library Facility

The library is the heart of teaching and research. The central library has a huge collection of books and bound periodicals. The department also has a departmental library. In order to facilitate all the readers in selecting the reading materials of their choice, the access to stacks is open to its members.

It works as nerve center of the institution by keeping the knowledge of students and faculty members updated. Information data bank is constantly updated and facilities are added. The central library is equipped with Ebscohost database, which contains large number of e-books and e-journals. Some e-journals are: ACM Transactions and IEEE Transactions etc. E-books are available for most of the international publishers.

3.3 ICT

The responsibilities of the Information and Communication Technology (ICT) unit comprise: the development and maintenance of the AUST ICT infrastructure; the provision of ICT advice for projects; the management of online services and databases.

3.4 Laboratory

AUST has two dedicated computer lab (20 computers each), one advanced lab (10 high configuration Apple computers) and one High performance computer (HPC), which provides computer services to the students. Computer labs are typically provided by libraries to the public, by academic institutions to students who attend the institution, or by other institutions to the public or to people affiliated with that institution.

4.0 COURSE CONTENT/SYLLABUS

4.1 Course Structure for Computer Science

Course Structure at 100 Level

Course Code	Course Title	Units	Status	LH	PH
CHM 101	General Chemistry	3	R	45	-
CSC 101	Introduction to Computer Science	3	C	30	45
CSC 102	Introduction to Problem Solving	3	C	30	45
CSC 104	Computer Programming I	3	C	30	45
GST 111	Communication in English I	2	C	30	-
GST 112	Logic, Philosophy & Human Existence	2	E	30	-
GST 113	Nigerian Peoples and Culture	2	R	30	-
GST 121	Use of Library, Study Skills and ICT	2	R	30	-
MTH 101	General Mathematics I	3	R	45	-
MTH 102	General Mathematics II	3	R	45	-
MTH 103	General Mathematics III	3	R	45	-
PHY 101	General Physics I	3	R	45	-
PHY 102	General Physics II	3	R	45	-
PHY 107	General Physics Practical I	1	R	-	45
PHY 108	General Physics Practical II	1	R	-	45
CHM 102	Chemistry Piratical	1			
	TOTAL	38			

Course Structure at 200 Level

Course Code	Course Title	Units	Status	LH	PH
CSC 201	Computer Programming II	3	C	30	45
CSC 202	Fundamentals of Data Structures	3	R	30	45
CSC 203	Discrete Structures and Theory of Logic	3	R	45	-
CSC 204	Operating Systems	3	C	30	45
CSC 205	Computer Security	3	R	45	
CSC 206	Theory of Automata and Formal Languages	3	R	45	-
CSC 207	Computer Organization and Architecture	3	R	30	45
CSC 208	Cyber Forensic analytics	3	R	30	45
CSC 209	Database Management	3	C	45	-
GST 222	Communication in English II	2	C	30	-
GST 225	Contemporary Health Issues	2	R	30	-
GST 211	Environment & Sustainable Development	2	R	30	-
GST 223	Introduction to Entrepreneurship	2	R	30	-
STA 201	Statistics	3	R	30	45
	Elective	2			
	TOTAL	40			

Electives: Elective courses may be selected from the following: MTH 204, Linear Algebra I (2 units); MTH 205, Linear Algebra II (2 units); PHY 201 General Physics III (2 units)

Course Structure at 300 Level

Course Code	Course Title	Units	Status	LH	PH
CSC 301	Machine Learning Techniques	3	R	45	-
CSC 303	Design and Analysis of Algorithm	3	R	45	-
CSC 305	Web Technology	3	R	45	-
CSC 307	Systems Analysis and Design	3	R	30	45
CSC 309	Object Oriented System Design	3	C	30	45
GST 311	Peace Studies and Conflict Resolution	2	E	30	-
GST 324	Leadership Skills	2	R	30	-
CSC 399	SIWES	6			
	TOTAL	25			

Course Structure at 400 Level

Course Code	Course Title	Units	Status	LH	PH
CSC 401	Data Analytics	3	R	45	-
CSC 402	Artificial Intelligence	3	R	45	-
CSC 403	Software Engineering	3	C	45	45
CSC 404	Human Computer Interface	3	R	30	-
CSC 405	Net-Centric Computing	3	R	45	-
CSC 406	Cloud Computing	3	E	30	45
CSC 407	Computer Networks and Communications	3	C	30	45
CSC 408	IT Project Management	3	E	30	45
CSC 409	Compiler Construction	3	R	45	-
CSC 499	Project	6	C		
	TOTAL	33			

Electives: 9 Units to be selected from

Course Code	Course Title	Units	Status	LH	PH
CSC 410	Augmented & Virtual Reality	3	E	45	-
CSC 411	Blockchain Architecture Design	3	E	45	-
CSC 412	Big data Analysis	3	E	45	-
CSC 413	Distributed Computing System	3	E	30	45
CSC 414	Computer Graphics and Visualisation	2	E	30	45
CSC 415	Optimization Techniques	3	E	30	45
CSC 416	Social Network Analytics	3	E	30	45
CSC 417	Information Technology Law	3	E	30	-
CSC 418	Modelling and Simulation	3	E	30	45
CSC 419	Special Topics in Computer Science	3	E	30	45

Course Synopses

CSC 101: Introduction to Computer Science

Survey of computers and information processing and their roles in society. This course introduces a historical perspective of computing, hardware, software, information systems, and human resources and explores their integration and application in business and other segments of society. Students will be required to complete lab assignments using the PC's operating system, and several commonly used

applications, such as word processors, spreadsheets, presentations, graphics and other applications. Internet and on-line resources, browsers and search engines.

CSC 102: Introduction to Problem Solving
Role of Algorithms in problem solving process, concepts and properties of Algorithms. Implementation strategies, Development of Flow Charts, Pseudo Codes. Program objects. Implementation of Algorithms in a programming Language – Visual BASIC/JAVA/C/C++

CSC 104: Computer Programming I
Introduction to problem solving methods and algorithm development, designing, coding, debugging and documenting programmes using techniques of a good programming language style, programming language and programming algorithm development. A widely used programming language should be used in teaching the above.

CSC 201: Computer Programming II
Principles of good programming, structured programming concepts, Debugging and testing, string processing, internal searching and sorting, recursion. Use a programming language different from that in CSC 201. e. g. C-Language

CSC 202: Fundamentals of Data Structures
Primitive types, Arrays, Records Strings and String processing, Data representation in memory, Stack and Heap allocation, Queues, TREES. Implementation Strategies for stack, queues, trees. Run time Storage management; Pointers and References, linked structures.

CSC 203: Discrete Structures and Theory of Logic
Basic Set Theory: Basic definitions, Relations, Equivalence Relations Partition, Ordered Sets. Boolean Algebra & Lattices, Logic, Graph theory: Directed and Undirected graphs, Graph Isomorphism, Basic Graph Theorems, Matrices; Integer and Real matrices, Boolean Matrices, Matrices med m, Path matrices. Adjacency Vectors/Matrices: Path adjacency matrix, Numerical & Boolean Adjacency matrices. Applications to counting, Discrete Probability Generating Functions.

CSC 204 Operating Systems
Overview of O/S: Role & Purpose, Functionality Mechanisms to Support Client- server models, hand-held devices, Design Issues influences of Security, networking, multimedia, Windows.
O/S Principles: Structuring methods, Abstraction, processes of resources, Concept of APIS Device organization interrupts.

CSC 205 Computer Security
Information management, Computer systems, Risk management, Cyber law and ethics, Technical report writing, Investigation techniques, encryption and decryption

CSC 206 Theory of Automata and Formal Languages
Fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine.

CSC 207: Computer Organization and Architecture
Fundamental building blocks, logic expressive immunization, sum of product forms. Register transfer notation, Physical considerations. Data representation, and number bases, Fixed and Floating point

systems, representation memory systems organization and architecture. Memory system, general; characteristics of memory operation. (Technology-magnetic recording semi-conductor memory, coupled devices, magnetic bubble). Memory addressing, memory hierarchy, virtual memory control systems. Hardware control, micro programmed control, Asynchronous control, i/c control. Introduction to the methodology of faulty tolerant computing.

CSC 208 Cyber Forensic Analytics
Introduction to Digital Forensics, Legal Considerations and search authority, The Investigation Process, Recognizing and Collecting Digital Evidence, Preservation of evidence/On scene triage, Hash values and file hashing.

CSC 209: Database Management
Introduction to Databases and Transactions, Database Design, ER-Diagram, Constraints, Views, and SQL, Data Models, Relational Algebra and Calculus.

CSC 301 Machine Learning Techniques
Introduction to Machine Learning, Supervised Learning and Linear Regression, Classification and Logistic Regression, Decision Tree and Random Forest, Naïve Bayes and Support Vector Machine, Unsupervised Learning.

CSC 303 Design and Analysis of Algorithm
Basic algorithmic analysis: Asymptotic analysis of Upper and average complexity bounds; standard Complexity Classes Time and space tradeoffs in algorithms analysis recursive algorithms. Algorithmic Strategies: Fundamental computing algorithms: Numerical algorithms, sequential and binary search algorithms; sorting algorithms, Binary Search tress, Hash tables, graphs & its representation.

CSC 305 Web Technology
HTTP communication protocol, the markup languages HTML, XHTML and XML, the CSS and XSLT standards for formatting and transforming web content, interactive graphics and multimedia content on the web, client-side programming using Javascript.

CSC 307: Systems Analysis and Design
System Concept; System Development Life Cycle
Analysis: Fact gathering Techniques, data flow diagrams, Process description data modelling.
System Design: Structure Charts, form designs, security, automated Tools for design.

CSC 309: Object-Oriented System Design
Basic OOP Concepts: Classes, Objects, inheritance, polymorphism, Data Abstraction, Tools for developing, Compiling, interpreting and debugging, Java Programs, Java Syntax and data objects, operators. Central flow constructs, objects and classes programming, Arrays, methods. Exceptions, Applets and the Abstract, OLE, Persistence, Window Toolkit, Laboratory exercises in an OOP Language.

CSC 401: Data Analytics
Introduction to Data Analytics, Data Analytics Lifecycle, Data Analysis, Frame Works and Visualization, Introduction to Python

CSC 402: Artificial Intelligence

- Introduction**:** Introduction–Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents–Typical Intelligent Agents – Problem Solving Approach to Typical AI problems,
- Problem Solving Methods: Problem solving Methods – Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games, Knowledge Representation,

CSC 403: Software Engineering

Software Design: Software architecture, Design Patterns, O. O. analysis & Design, Design for re-use. Using APIS: API programming Class browsers and related tools, Component based computing. Software tools and Environment: Requirements analysis and design modelling Tools, Testing tools, Tool integration mech.

CSC 404 Human Computer Interface

Foundations of HCI, Principles of GUI, GUI toolkits; Human-centred software evaluation and development; GUI design and programming.

CSC 405 Net Centric Computing

Distributed Computing, Mobile & Wireless computing, Network Security; Client/Server Computing (using the web), Building Web Applications.

CSC 406 Cloud Computing

Introduction to Cloud Computing, Defining cloud computing, Components of a computing cloud, Differentiating types of clouds: public, private, hybrid, Delivering services from the cloud, Categorizing service types, Comparing vendor cloud products: Amazon, Google, Microsoft and others. Key drivers of cloud computing solutions, Instantaneous provisioning of computing resources, Tapping into an infinite storage capacity, Cost-effective pay-as-you-use billing models, Characterizing SaaS, Streamlining administration with centralized installation, Optimizing cost and performance with scale on demand, Delivering Platform as a Service (PaaS).

CSC 407 Computer Networks and Communications

Introduction, wares, Fourier analysis, measure of communication, channel characteristics, transmission media, noise and distortion, modulation and demodulation, multiplexing, TDM FDM and FCM Parallel and serial transmission (synchronous vs asynchronous). Bus structures and loop systems, computer network Examples and design consideration, data switching principles broadcast techniques, network structure for packet switching, protocols, description of network e.g. ARPANET, etc.

CSC 408 IT Project Management

Team Management, Project Scheduling, Software measurement and estimation techniques, Risk analysis, Software quality assurance, Software Configuration Management, Project Management tools.

CSC 409: Compiler Construction

Review of compilers assemblers and interpreters, structure and functional aspects of a typical compiler, syntax semantics and, functional relationship between lexical analysis, expression analysis and code generation. Internal form of course programme. Use of a standard compiler (FORTRAN/COBOL/PL) as a working vehicles. Error detection and recovery. Grammars and Languages: the parsing problem.

CSC 410 Augmented and Virtual Reality
Introduction to augmented reality (AR), The basics of AR functionality, Taking the next steps with ARCore, Bringing ARCore to life

CSC 411 Blockchain Architecture Design
Introduction to Blockchain – I (Basics, History, Architecture, Conceptualization), Basic Crypto Primitives, Bitcoin Basics, Distributed Consensus, Consensus in Bitcoin – I (The Basics, PoW and Beyond, The Miners), Permissioned Blockchain (Basics, Consensus), Permissioned Blockchain(RAFT Consensus, Byzantine General Problem, Practical Byzantine Fault Tolerance), Blockchain for Enterprise – Overview, Blockchain Components and Concepts, Hyperledger Fabric – Transaction Flow, Hyperledger Fabric Details, Fabric – Membership and Identity Management, Hyperledger Fabric Network Setup, Fabric Demo on IBM Blockchain Cloud.

CSC 412 Big data Analytics
Big Data Enabling Technologies, Hadoop Stack for Big Data, Hadoop Distributed File System (HDFS), Hadoop MapReduce, MapReduce Examples, Spark, Parallel Programming with Spark, Spark Built-in Libraries, Data Placement Strategies, Data Placement Strategies, CQL (Cassandra Query Language), Design of HBase, Spark Streaming and Sliding Window Analytics, Big Data Machine Learning, Machine Learning Algorithm K-means using Map Reduce for Big Data Analytics, Parallel K-means using Map Reduce on Big Data Cluster Analysis, Decision Trees for Big Data Analytics.

CSC 413: Distributed Computing Systems
Introduction: Definitions, Motivation; Communication Mechanisms: Communication Protocols, RPC, RMI, Stream Oriented Communication; Synchronization: Global State, Election, Distributed Mutual Exclusion, Distributed Transactions; Naming: Generic Schemes, DNS, Naming and Localization; Replication and Coherence: Consistency Models And Protocols; Fault Tolerance: Group Communication, Two-And Three-Phase Commit, Check pointing; Security: Access Control, Key Management, Cryptography; Distributed File Systems: NFS, Coda etc.

CSC 414: Computer Graphics and Visualization
Hardware aspect, plotters microfilm, plotters display, graphic tablets, light pens, other graphical input aids Facsimile and its problems Refresh display refresh huggers, changing images, light pen interaction. Two and three dimensional transformation, perspective Clipping algorithms. Hidden line removal bolded surface removal. Warnock method/ algorithm, shading, data reduction for graphical input. Introduction to had writing and character recognition. Curve synthesis and fitting. Contouring. Ring structures versus doubly linked lists. Elerarchical structures. Data structure: Organization for intersotive graphics.

CSC 415 Optimization Techniques
Linear Programming: Graphical Method, Simplex method, Penalty Method, Transportation Models, Assignment Models, Sequencing, and Scheduling Models by Johnson's Algorithm.

CSC 416 Social Network Analysis
Getting Started and Formalizing Networks, Social Network Analysis, Analyzing a Network with Software, Network Evolution.

CSC 417 Information Technology Law
Introduction to cyberspace & cyberlaw, Regulation, IP protection for software, Copyright in Cyberspace: introduction, Copyright in cyberspace: P2P, downloading and enforcement, Content liability, Trademarks, the internet and domain names, Cybercrime, Online Privacy

CSC 418 Modeling and Simulation
Simulation Basics: Handling Stepped and Event-based Time in Simulations, Discrete versus Continuous Modelling, Numerical Techniques, Sources and Propagation of Error, Dynamical, Finite State, and Complex Model Simulations: Graph or Network Transitions Based Simulations, Actor Based Simulations, Mesh Based Simulations, Hybrid Simulations, Converting to Parallel and Distributed Simulations: Partitioning the Data, Partitioning the Algorithms, Handling Inter-partition Dependencies, Probability and Statistics for Simulations and Analysis: Introduction to Queues and Random Noise, Random Variates Generation, Sensitivity Analysis

CSC 419: Special Topics in Computer Science
Special topics from any area of computer science considered relevant at given time. Topics are expected to change from year to year. Apart from seminars to be given by lecturers and guests, students are expected to do substantial readings on their own.

CSC 499: Project
Students should embark on work that will lead to substantial software development under the supervision of a member of staff.