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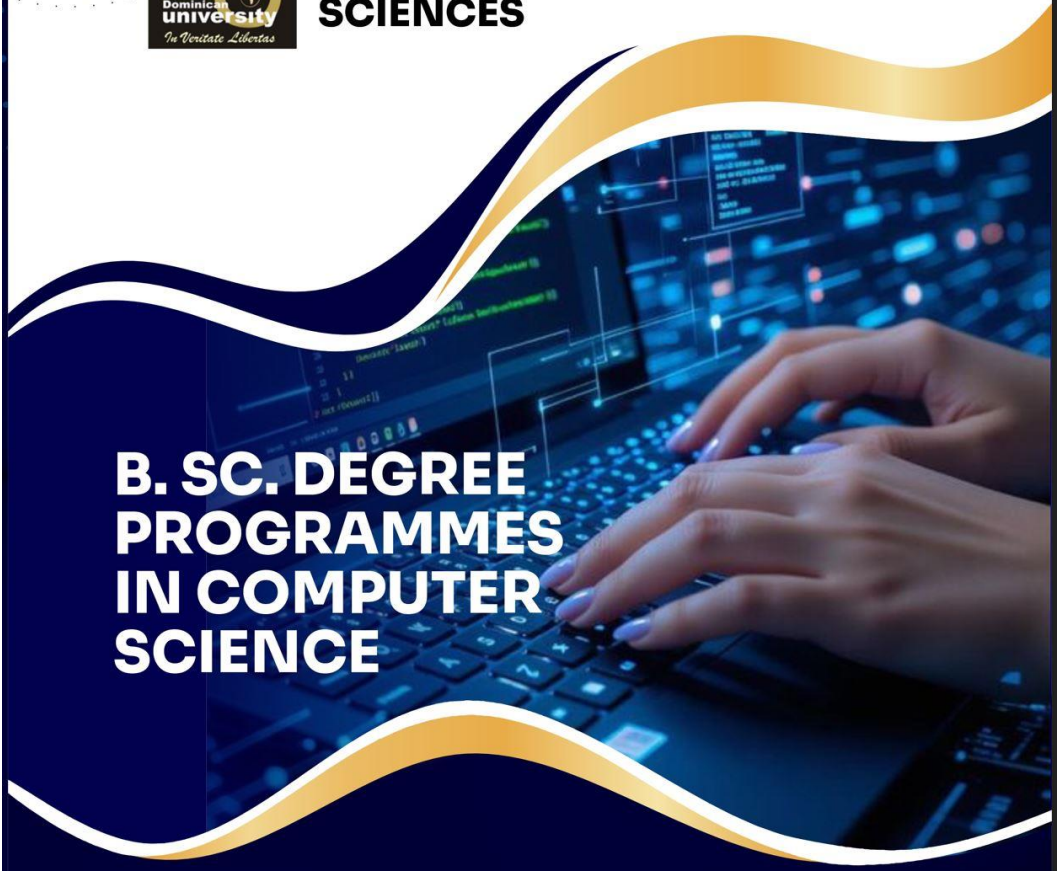
DEPARTMENT OF PHYSICAL & MATHEMATICAL SCIENCES



B. SC. DEGREE PROGRAMMES IN COMPUTER SCIENCE

CORE CURRICULUM MINIMUM ACADEMIC STANDARDS (CCMAS)

DEPARTMENT OF PHYSICAL AND MATHEMATICAL SCIENCES

B. SC. DEGREE PROGRAMMES IN COMPUTER SCIENCE (CCMAS)

2024/2025 ACADEMIC SESSION

Table of Content

INTRODUCTION

This handbook contains basic information and regulations on the Computer Science programme already approved under the Department. Hence, the handbook will be revised as more programmes are made available in the Department. The regulations contained in this handbook are also subject to revision whenever there are changes in the University and/or Faculty regulations. The following are applicable to the programmes.

STUDENT GENERAL CONDUCT AND DISCIPLINE

All students are expected to comport themselves in a respectable manner in the Department. Students are to refrain from the following while in the University:

i. All examination misconduct.
ii. Unruly behaviour
iii. Indecent behaviour and dressing
iv. Vandalism
v. Miscellaneous Hall offences
vi. Unauthorized use / displacement / damage to the University property
vii. Pilfering
viii. Insubordination
ix. Direct sale of bed spaces / squatting in Halls of Residence
x. Illegal participation in the National Youth Service programme
xi. Illegal registration as fulltime students
xii. Infringement of other University regulations.

In addition, students must also refrain from the following criminal offences:

i. Fraud
ii. Theft
iii. Burglary
iv. Physical assault on or fighting with fellow students
v. Murder
vi. Membership of a secret cult inside or outside the campus

vii. Possession of fire arms
viii. Arson
ix. Rape
x. Possession and / or use of hard drug and drug trafficking
xi. Other criminal offences

Students caught with any of these, or committing of these offences or misconducts will be sent to the Student Disciplinary Committee without any hesitation for appropriate sanction(s).

COURSE REQUIREMENTS

The 3-letter course coding system will follow the CCMAS rules. The four levels of courses shall follow the numbering system 101 – 199, 201 – 299, 301 – 399, 401 – 499, with each course number prefixed by three-letter code indicating the programme in which the course is domiciled; for example, COS 202, MTH 101 for Computer Science and Mathematics courses respectively.

The course structure of the new CCMAS has also forced the modification of the definition of the following terminologies which apply to the course system being offered in the department of Physical and Mathematical Sciences Department. Because the Core Curriculum Minimum Academic Standards (CCMAS) is for the degree programmes in the Computing discipline stipulates the minimum academic requirements for the training of undergraduates in various programmes in the discipline, we have the following definitions of courses:

(a) **Compulsory**: All the courses contained in the 70% Core Curriculum of the CCMAS, courses in the 30% university addition, a student must take and pass these courses with 40% and above.

(b) **Required**: A course added by the Department or Faculty Board which a student must take at a level of study before graduation. The Department usually will specify the minimum number of units to be passed where there are a

number of such courses. The number of these courses has drastically reduced due to increase in the number of compulsory ones above.

(c) **Elective**: The courses specified by the Department which a student can take in order to increase the total number of his/her units. Students may graduate without passing the course provided the minimum credit for graduation had been attained.

(d) **Pre-requisite**: A course which students must take and pass before taking a particular course at a higher level.

(e) **Concurrent**: A course which a student must take during the same semester as another specified course.

Note: All the courses registered/taken by a student, whether passed or failed, will be used in computation of his/her final result.

Unit Definition

According CCMAS definitions, all courses are sub-divided into more or less self-sufficient and logically consistent packages that are taught within a semester and examined at the end of that particular semester. Instructions and evaluations shall be by courses evaluated in terms of credit units. A credit unit is defined as one 1-hour of lecture/tutorial contact per week, or three hours of Laboratory and/or practical class per week through the semester.

The courses are arranged in progressive order of complexity or in levels of academic progress, e.g., Level I courses are 100, 101 and Level II courses are 200, 202. The second aspect of the system is that courses are assigned weights allied to Units.

Units consist of specified number of student-teacher contact hours per week per semester. Units are used in two complementary ways: one, as a measure of course weighting, and the other, as an indicator of student workload.

As a measure of course weighting for each unit course, the credit unit to be earned for satisfactorily completing the course is specified; e.g. a 2-credit unit course may mean two 1-hour lectures per week per semester or one 1-hour lecture plus 3-hour practical per week per semester.

As a measure of workload, "One Credit Unit" means one hour of lecture or one hour of tutorial per week per semester. For other forms of teaching requiring student-teacher contact, the following equivalents may apply: two hours of seminar: three hours of laboratory or field work, practicum; four weeks of industrial attachment where applicable.

Course Codes

The course codes for undergraduate courses in the department shall be three-letter abbreviation identifying the specific field of the course; e.g. MTH, COS, BIO, etc., and numbered as follows:

Level	1st Semester
100 Level	101-199
200 Level	201-299
300 Level	301-399
400 Level	401-499

STUDENT WORKLOAD/ REGISTRATION

A student shall normally be required to register for a minimum of 15 credit units and a maximum of 24 credit units during each semester, including the credit units of the required General Studies. After registration, changes in the courses shall normally be completed within two weeks after registration in any particular semester. Any further modification after the specified period will attract a fine and must be approved by the Head of Department.

COURSE ASSESSMENT AND EXAMINATION

Tutorials

The timetable for courses is designed to make provision for tutorials of at least one hour for every four hours of lecture. Thus a 3-unit course of 45 hours per semester should attract about 10 hours of tutorials.

Continuous Assessment

Continuous Assessment in each course is conducted through tests, quizzes, tutorials, assignments and reports or through other means consistent with the objectives and conduct of the course as determined by the Department.

1. Scores from continuous assessment constitutes 30% of the full marks for courses which are primarily theoretical.
2. For courses which are partly practical and partly theoretical, scores from continuous assessment may constitute 40% of the final marks.
3. For courses that are entirely practical, continuous assessment is based on a student's practical work or reports and constitute 100% of the final marks.

Examination

There shall normally be an examination for all courses taught during a semester at the end of the semester, in addition to continuous assessment. All courses shall be graded out of a maximum of 100 marks comprising: Final Examination: 60% - 70%. Continuous assessment (Quizzes, Homework, Tests): 30% - 40%.

Each student will be credited with the number of course units assigned to each course he/she passed. A duly registered student who must have attained a minimum of 75% attendance in the course is eligible for the examination.

Each course shall normally be completed and examined at the end of the semester in which it is offered. The minimum duration for a written examination is one hour for one unit course.

Regulations on Examinations

1. Only candidates that have registered and submitted their course registration forms to the Department are eligible to write examinations.
2. Candidates must arrive venue of examination 30 minutes before the take-off of an examination.
3. Candidates must come into the examination hall with their Identity Cards.
4. No programmable calculator, mobile phones, digital wrist – watch, ear piece are allowed inside the examination hall.
5. Candidates are to bring along their pens, pencils, erasers and rulers into the examination hall as borrowing of any material will not be tolerated.
6. Candidates should not bring anything that can implicate them into the examination hall (e.g. papers with pre-written answers or some jottings relating to the examination paper)
7. Candidates should check their surroundings for any implicating materials immediately they get to their seats for examinations. Such materials found should be gotten rid of before papers are distributed.
8. Candidates will not be allowed into the examination hall 30 minutes after the take – off of an examination unless the reason given by the students is reasonable, cogent and sufficiently convincing.
9. Candidates will not be allowed to stand up or go out 30 minutes to the end of an examination.
10. Candidates going out to ease his / her self during examination periods will be accompanied with an appropriate invigilator.
11. Talking, laughing, eating, smoking or discussion among candidates in the examination may warrant the invigilator(s) to send such candidates out of the examination hall.

12. A candidate who is sick on the day of an examination should notify the Level Adviser / Examination Officer at least one hour before the examination if he / she is admitted at the University Clinic and willing to write the paper.
13. Candidates must adhere strictly to the sitting arrangement made by the invigilators.
14. Candidates must write their matriculation numbers legibly with all other information, sign the answer scripts they use, write out the questions' numbers they answer at the front cover of the scripts and submit the scripts to the invigilators at the end of the examination.
15. Examination answer scripts / sheets whether used or unused should not be taken out of the examination hall by the students.
16. Failure to abide by these rules may lead a candidate to Student Disciplinary Committee (SDC).

SIWES rating and assessment

All students taking any degree in Computing must undergo industrial training in order to earn a minimum of 6 credit units. The minimum duration of the Students Industrial Work Experience Scheme (SIWES) should be 24 weeks. Students should be assessed using the Log Book, a report and a Seminar.

Grading System

Student performance on a course, at all levels, will be recorded in letter grades (after due conversion from percentage scores) and grade points as shown in Table 1.

Table 1: Grade Point

Letter Grade	Grade Point	Marks
A	5.0	70 – 100
B	4.0	60 – 69
C	3.0	50 – 59
D	2.0	45– 49
E	1.0	40 – 44
F	0	< 40

The number of grade points for each course completed by a student is computed by multiplying the number of credit units for the course by the point equivalent of the grade he/she obtained in that course.

A student is required to obtain a minimum grade of E for each examination he takes. A student should repeat a compulsory course in which he failed to obtain a minimum pass grade so as to be used in computation of Computation of Cumulative Grade Point Average (CGPA).

For a group of required courses where a student fails to pass the specified number of units, he/she is expected to retake a number of courses to make up the required units.

At the end of each semester when the grades for all courses have been assembled, each student's cumulative grade point average is calculated by dividing total number of grades by the total number of units of all degree courses for which the student has registered.

Computation of Cumulative Grade Point Average

A student's standing at the end of every semester is ascertained through the Cumulative Grade Point Average system. This is computed by dividing the Total Weighted Grade Point (TWGP) by the Total Number of Unit (TNU) for all the courses taken (passed or failed) in the session. The TWGP is the sum of the individual course units multiplied by the grade point equivalence of the mark obtained in the course, for all the courses taken in the semester. Table 2 illustrates these.

Table 2: Calculation of CGPA

Course	Unit (U)	Grade Point (GP)	Units x Grade Point U x GP
C_1	U_1	GP_1	$U_1 \times GP_1$
C_2	U_2	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 (T)	**TNU**	**TGP**	**TWGP**

$$\boldsymbol{CGPA} = \frac{\boldsymbol{TWGP}}{\boldsymbol{TNU}}$$

where TWGP = Total Weighted Grade Point; TNU = Total number of course units registered.

Computation of units and grades start from 100, 200 level or higher depending on the point of admission into the University, so that the cumulative grade point average at graduation is for the entire programme.

Degree Classifications

The determination of the class of degree for a student shall be based on the Cumulative Grade Point Average (CGPA) earned at the end of the programme. The CGPA shall be used in the determination of the class of degree as summarized in the Table 3. It is important to note that the CGPA shall be calculated and expressed correct to two decimal places.

Table 3: Determination of Class of Degree

Matriculation Number	**23456**
Year of Entry	2017/2018
Total Units Taken	160
Total Units Passed	140
Total Weighted Grade Point	550
Cumulative Grade Point Average	550/160 = 3.44
Class of Degree	Second Class Lower (2^2)

Table 4: Class of degree

CGPA	**Class of Degree**
4.50 –5.00	First Class
3.50 – 4.49	Second Class Upper Division (2^1)
2.40 – 3.49	Second Class lower Division (2^2)
1.50 – 2.39	Third Class (3^{rd})
1.00 -- 1.49	Pass
below 1.00	No Degree

The normal period of study for an honours degree shall be eight semesters for 100 level entrants and six semesters for 200 level direct entry students. The maximum length of time allowed shall be ten semesters for the 4-year degree programme and eight semesters for students admitted through Direct Entry.

Transfers, Probation and Withdrawal of Students

If a student's CGPA falls below the minimum set by the Senate (presently 1.50) at end of any year of study such a student will be placed on probation. He will be allowed to register for the course units failed as well as some course units from the next level provided his total credit load falls within the maximum allowed and provided the failed course unit is not a prerequisite to the next level course. If at the end of the probation year his cumulative grade point average still falls below the stipulated (i.e. 1.50), such a student will be asked to withdraw from the Department and

transfer to another programme in the University suitable to his/her capacity.

A transfer student to the Department due to poor performance in another programme is not eligible for another transfer for the same reason.

A student who transfers from another programme to the Department or from another university may be credited with those course credit units earned which are relevant to the curriculum of the programme(s) in the Department.

A transfer student with advance standing will be required to spend not less than two academic sessions in the Department to be eligible for graduation.

Students' Evaluation of Courses

The students will be required to evaluate courses delivered to them at the end of each semester using the mechanism provided by the Academic Planning Unit. This is an integral component of the course system as required by the NUC and stated in the CCMAS. It serves as feedback mechanism for achieving the following:

1. improvement in the effectiveness of course delivery;
2. continual update of lecture materials to incorporate emerging new concepts;
3. effective usage of teaching aids and tools to maximise impact of knowledge on students; and
4. improvement in students' performance through effective delivery of tutorials, timely conduct of continuous assessment and high-quality examination.

The evaluation is conducted twice before the final semester examinations. It is administered through the use of well-designed questionnaires. The completed questionnaires will be professionally analysed and results discussed with course lecturers towards improvement in course delivery in all its ramifications.

COMPUTER SCIENCE (B. Sc. Honours Degree)

Duration: 4 Years (8 Semester)

Philosophy:

The Computer Science undergraduate programme is designed to equip the students for their future professions. The programme is structured to engender creative and innovative skills in the students. Hence, it will be driven by the two interlocking elements: global currency and local relevance. By global currency, the programme provides students with the theoretical principles and engineering rigour that drive the latest computing innovations in the world. Our students will remain abreast with global innovations. By local relevance, the programme ensures that our students can creatively bring the best and latest innovations to bear on solving problems in Nigeria. By training our students to respond to the relevant needs of the people and industries in Nigeria, we can be sure they will have a greater chance of (self) employ-ability after graduation.

Dominican University Computer Science degree is an edge for scientific and technological career advancement; for acquisition of competence in computer programming, system analysis and development, database analysis and implementations, etc.; for the use of computer for the systematic understanding of the managerial sciences; for philosophical and ethical approach to the virtual world, given the philosophy that truth liberates. Going through the programme, students gradually acquire skills in understanding theoretical problems and their computer aided solutions and applications to physical and real life situation. By this programme the students are also prepared for further studies in computer science and engineering or for diverse professional training in other related fields.

ADMISSION REQUIREMENTS

Four-Year Degree programme.

To be admitted, candidate must possess five (5) credit passes at SSCE or GCE or NECO (O' level) including English Language, Mathematics, Physics and any two Science subjects from the following list: Further Mathematics, Chemistry, Biology, Geography, Agricultural Science, Economics; with any other approved Art or Social Science subject. The five subjects must be had at one sitting. Alternatively, candidates must have at least six credit passes at two sittings including English Language, Mathematics, Physics and the above listed. The UTME subjects are English Language, Mathematics, Physics and any other science subject from the following list: Chemistry, Biology, Geography, Agricultural Science, Economics.

Three-Year Degree—Direct Entry

To be eligible, (1) candidate must meet the O/Level requirements, as given above, and must possess GCE A/Level passes in Mathematics and at least one of the following Science Subjects: Physics, Chemistry, and Geography. (2) Equivalently, candidate must possess credit level pass in Ordinary National Diploma (OND) or Merit Pass in National Certificate in Education (NCE) certificate with Mathematics and any one of the Science subjects above as teaching subjects. (3) A first degree or Higher National Diploma in any Science Course, with at least a 2nd Class Upper Division.

GRADUATION REQUIREMENTS

The Bachelor's degree programme in Computer Science is a full time, 4-Year programme for UTME and 3-Year programme of direct entry. To receive the award of B. Sc.

Degree in Computer Science, a student must pass a minimum of 120 units for the 4-Year programme or 90 units for the 3-Year direct entry programme. The units must be spread at a minimum of 30 passed credit units at each level, subject to the following regulations.

1. All compulsory courses must be passed.
2. At least one required course must be passed in the group of mathematics and statistics, making a total of 5 required units to be passed at 100 level.
3. At least one required course must be passed in 200 level mathematics (i.e. 2 units of Mathematics) and one required course must be passed among the other required courses (i.e. INS 202 or DTS 204).
4. At least one required course must be passed in 300 level (i.e. 2 units).
5. Students are required to pass 16 units out of the 19 required units at 400 level.

Summary

70% of the NUC/CCMAS Courses = 84 Credit Units
30% of the Dominican University developed courses = 36 Credit Units
Total of NUC/CCMAS and DUI Credit Units = 120 Units

List of Academic Staff

S/N	Name	Rank	Status	Staff Qualification	Specialisation
1.	John B. Oladosu	Professor	Part time	Ph.D. Computer Science 2011. M.Sc. Computer Science 2006.	Computer Networks, Machine Learning and NLP
2.	Solomon O Akinola	Professor	Part time	Ph.D. Computer Science 2010 M.Sc. Information Science 2001. BSc. Computer Science 1998	Software Engineering and Data Mining
3.	Adebola K. Ojo	Reader	Part time	Ph.D. Computer Science 2017 M.Sc. Computer Science 2005. BSc. Computer Engineering 2001	Data Mining
4.	Adejoke Olamiti	Reader	Full time	Ph.D. Computer Science 2015. M.Sc. Computer Science 1990. B.Sc. Computer Science 1989.	Data Mining
5.	Michael Akpoghiran O.P.	Senior Lecturer	Full time	Ph.D. Computer Science 2020 M.Sc. Computer Science 2014.	Communication and Network Security
6.	Juliet Shenge	Senior Lecturer	Adj.t	Ph.D. Virology M.Sc. Virology B.Sc. (Hons) Microbiology	Virology

S/N	Name	Rank	Status	Staff Qualification	Specialisation
7.	Nancy Chinyere Woods	Senior Lecturer	Part time	Ph.D. Computer Science 2017. M.Sc. Computer Science 2009. Masters in Microprocessor and Control Engineering, 2004. B.Sc. Computer Science 1995.	Artificial Intelligence and Image Processing
8.	Nicholas Okwuchukwu Okeke, OP	Senior Lecturer	Full time	Ph.D. Mathematics 2023 M. Sc. Mathematics, 2014 B. Tech Mathematics and Computer Science, 1998	Functional Analysis
9.	Omokehinde Deji-Akinpelu	Lecturer I	Full time	Ph.D. Computer Science 2022. M.Sc. Computer Science 2012. BTech. Computer Engineering 2005	Data Communication and Networks
10.	Gabriel Avbenake OP	Lecturer II	Full time	M.Sc. Applied Computing, 2021 M. Inf. Sci 2015	NLP, Data mining
11.	John Adebayo	Assistant lecturer	Full time	Ph.D. Physics 2025 M.Sc Physics. .2014 B.Sc Geophysics. .2010	Solid Earth Physics

S/N	Name	Rank	Status	Staff Qualification	Specialisation
12.	Tijesu Oladimeji	Assistant lecturer	Full time	M.Sc. Computer Science 2019. B.Sc Computer Science 2015.	Machine Learning
13.	Akintunde Akinnifesi	Assistant Lecturer	Full Time	M.Sc. Computer Science 2019. B.Sc. (Ed) Computer Science 2013	Computer Networks (Information Security)/ Hardware

List of Non- Academic Staff

S/N	Name	Rank	Qualifications
	Hycentha Chibuzor Odinko	Higher Executive Officer	M.Ed. Educational Psychology and School Counseling 2017 B.Ed. Guidance and Counseling/ Political Science 2014
1	Mr. Idowu Akinwale	Lab Technician	HND Physics Electronics (1999) Member NIST
2	Mr. I.S. Abioye	Lab Technician	OND Computer Science, Ibadan Poly (2007) HND Computer Science, Ibadan Poly (2013)
4	Mr. Mcglorie Anyamele	Laboratory Attendant 14th September, 2018	WAEC (1978) Certificate in English Language (1999)

LOCAL 30% INSTITUTIONAL ADDITION

Summary of Courses

100 Level DUI Courses

Course Code	Course Title	Units	Status	LH	PH
DUI-CST 105	Morality and Gracious Living	2	C	30	
DUI-CST 107	Catholic Church and the Society	2	C	30	
	Total	4			

200 Level DUI Courses

Course Code	Course Title	Units	Status	LH	PH
DUI-CMP 202	Visual Presentations for Effective Communication	2	C	15	45
DUI-CIE 201	Introduction To Creativity and Innovation	2	C	15	45
DUI-CMP 204	Basic Use of Computers and Office Applications	2	C	15	45
	Total	**6**			

300 Level DUI Courses

Course Code	Course Title	Units	Status	LH	PH
DUI-CMP 302	Survey of Programming Languages	3	C	30	45
DUI-CMP 304	Cyber Tools and AI Proficiency	2	C	15	45
DUI-CMP 306	Desktop Publishing & Graphic Design	2	C	15	45
DUI-CIE 308	Creativity And Innovation for Business Success	2	C	30	0
DUI-CST 303	Ethics in Contemporary Time	2	C	30	0
	Total	**11**			

400 Level DUI Courses

Course Code	Course Title	Units	Status	LH	PH
DUI-CMP 402	Introduction to Machine Learning	3	C	15	45
DUI-CMP 406	Social Media Proficiency, Basic Video Editing & Web Traffic Analytics	2	C	15	45
DUI-CST 407	Applied Ethics in Professional Practice	2	C	30	0
DUI-CIE 408	Organisational Management of Creativity And Innovation In Computer Science	2	C	15	45
	Total	**9**			

COMBINED GLOBAL COURSE STRUCTURE AND INTEGRATED LOCAL CCMAS REQUIREMENT

100 Level (First Semester)

Course Code	Course Title	Units	Status	LH	PH
GST 111	Communication in English	2	C	15	45
COS 101	Introduction to Computing Sciences	3	C	30	45
MTH 101	Elementary Mathematics I	2	C	30	
MTH 102	Elementary Mathematics II	2	C	30	
PHY 101	General Physics I (Mechanics)	2	C	30	
PHY 107	General Practical Physics I	1	C	0	45
STA 111	Descriptive Statistics	3	C	45	
PHY 103	General Physics III	2	E	30	
CHM 101	General Chemistry I	2	E	30	
DUI-CST 105	Morality and Gracious Living	2	C	30	
	Practicum	0			
	Total	**21**			

100 Level (Second Semester)

Course Code	Course Title	Units	Status	LH	PH
GST 112	Nigerian Peoples and Culture	2	C	30	
COS 102	Problem Solving	2	C	30	
PHY 102	General Physics II	2	C	30	
PHY 108	General Practical Physics II	1	C	0	45
STA 121	Statistical Inference	3	R	45	
STA 112	Probability	3	R	45	
MTH 103	Elementary Mathematics III (Vectors, Geometry and Dynamics)	2	R	30	
CHM 102	General Chemistry II	2	E		
DUI-CST 107	Catholic Church and the Society	2	C	30	
	Practicum	0			
	Total	**19**			

Note:
At least one required course must be passed in both mathematics and statistics.

200 Level (First Semester)

Course Code	Course Title	Units	Status	LH	PH
ENT 211	Entrepreneurship and Innovation	2	C	30	
COS 201	Computer Programming I (Structured)	3	C	30	45
CSC 203	Discrete Structures	2	C	30	
IFT 211	Digital Logic Design	2	C	15	45
SEN 201	Introduction to Software Engineering	2	C	30	
MTH 201	Mathematical Methods I	2	C	30	
CYB 201	Intro to Cybersecurity and Strategy	2	C	30	
MTH 209	Introduction to Numerical Analysis	2	R	30	
IFT 203	Introduction to Web Technologies	2	C	15	45
DUI-CMP 202	Visual presentations for Effective Communication in Computer Science	2	C	30	0
DUI-CIE 201	Intro to Creativity and Innovation.	2	C	15	45
	Practicum				
	Total	**23**			

200 Level (Second Semester)

Course Code	Course Title	Units	Status	LH	PH
GST 212	Philosophy, Logic and Human Existence	2	C	30	
COS 202	Computer Programming II (OOP)	3	C	30	45
IFT 212	Computer Architecture and Organisation	2	C	15	45
MTH 202	Elementary Differential Equations	2	C	30	0
CSC 299	SIWES I	3	C		
INS 202	Human-Computer Interface (HCI)	2	R	15	45
MTH 204	Linear Algebra	2	R	30	0
DTS 204	Statistical Computing, Inference and modelling	3	R	45	0
PHY 202	Electric Circuit and Electronics	2	C	30	0
DUI-CMP 204	Basic Use of Computer and Office Applications in Computer Sc.	2	C	15	45
	Practicum	0			
	Total	**23**			

Note:

At least one required course must be passed in 200 level mathematics (i.e. 2 units of Mathematics) and one required course must be passed among the other required courses (i.e. INS 202 or DTS 204).

300 Level (First Semester)

Course Code	**Course Title**	Units	Status	LH	PH
GST 312	Peace and Conflict Resolution	2	C	30	
CSC 301	Data Structures	3	C	30	45
CSC 309	Artificial Intelligence	2	C	15	45
ICT 305	Data Communication System & Network	3	C	30	45
INS 204	System Analysis and Design	3	C	30	45
DTS 201	Introduction to Data Science	3	R	30	45
IFT 302	Web Application Development	2	C	15	45
DUI-CMP 304	Cyber Tools and AI proficiency	2	C	30	
DUI-CIE 308	Creativity And Innovation for Business Success	2	C	30	
DUI-MSR 121	Methodology of Scientific Research	2	R	15	45
	Total	**24**			

300 Level (Second Semester)

Course Code	Course Title	Units	Status	LH	PH
ENT 312	Venture Creation	2	C	15	45
CSC 308	Operating Systems	3	C	30	45
CSC 322	Computer Science Innovations and New Technologies	2	C	15	45
DTS 304	Data Management I	3	C	30	45
CSC 399	SIWES II	3	C		135
CYB 302	Biometrics Security (Graphics and Image processing)	2	E	15	45
IFT 304	Web Development using Content Management Systems	2	C	15	45
DUI-CMP 302	Survey of Programming Languages	3	C	30	45
DUI-CMP 306	Desktop Publishing & Graphic Design	2	C	15	45
DUI-CST 303	Ethics in Contemporary Times.	2	C	30	
	Practicum	0			
	Total	**24**			

Note:
At least one required course must be passed in 300 level (i.e. 2 units).

400 Level (First Semester)

Course Code	Course Title	Units	Status	LH	PH
COS 409	Research Methodology and Technical Report Writing	2	C	30	
CSC 401	Algorithms and Complexity Analysis	2	C	30	
INS 401	Project Management	2	C	30	
CSC 497	Final Year Project I	3	C	0	135
DTS 302	Big Data Computing	2	R	15	45
IFT 403	Mobile and Pervasive Computing	2	R	15	45
DUI-CST 407	Applied Ethics in Professional Practice for Computer Sc,	2	R	30	
DUI-CIE 401	Organisational Management of Creativity and Innovation	2	R	30	
	Practicum	0			
	Total	17			

400 Level (Second Semester)

Course Code	Course Title	Units	Status	LH	PH
CSC 402	Ethics and Legal Issues in Computer Sc.	2	C	30	
CSC 498	Final Year Project II	3	C	0	135
CSC 432	Distributed Computing Systems	2	R	30	0
IFT 310	Mobil Application Development	2	R	15	45
SEN 410	Software Architecture and Design	2	R	15	45
DUI-CMP 402	Introduction to Machine Learning	3	R	45	
DUI-CMP 406	Social Media Proficiency, Basic Video Editing & Web Traffic Analytics for collaborations in Comp. Sc.	2	R	15	45
	Total	**16**			
	Ground Total	**167**			

Note:

Students are required to pass 16 units out of the 19 required units at 400 level.

SENATE APPROVED RELEVANCE, OVERVIEWS, OBJECTIVES, LEARNING OUTCOMES, AND CONTENTS OF COURSES

DUI-CST 105: MORAL PHILOSOPHY (2 Units C: LH 30)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the University

Various religious systems have their spirituality based on their understanding of their Divine Beings and their relationship with those particular Divine Beings. These understanding of relationships and the nature of the Divine Beings find expressions in how each religion has developed ways and means to better the lives of adherents of these religions through obedience to belief systems and practices. The Christian religion is unique in many ways. While it has developed from the Jewish religion, it is still distinctively a radical departure from the old Judaism that gave birth to it. Understanding therefore the precepts of the Christian religion will be a function of knowing its theology for personal sanctification and personal relationship with God through Christ who is believed in Christianity to be the only begotten son of God and the redeemer of the world. A course on Moral Philosophy will therefore allow the graduates to possess a deep understanding of Morality and how to apply same knowledge to better their personal relationship with God human beings and their environment. The graduates of this course will also be able to apply same virtues to their fellow human beings. This goal is in accord with the vision of the DUI to produce multiple competent leaders who will show understanding by promoting religious tolerant among the various religious adherent of the world.

Overview

What is demanded by spiritual theology is not only a change in mind and morals but a comprehensive renewal embracing the person at all levels: cognitive, affective and social. Living by the power of Christ's Spirit is not a matter of knowing him in a detached or speculative way. One must enter wholeheartedly into a new existence informed by faith, guided by hope and inspired by love.

The spirit wishes to effect a progressive transformation of the total person. Touching and changing not only mind and memory but imagination and affections as well. Obviously, the Spirit can work effectively only if persons are resolute in dissociating themselves from all disorder.

The course aims to lead the students into the nature of the spiritual life in a way that gives meaning and purpose to the spiritual exercises they perform. It studies the nature of theology as a systematic reflection on the meaning and content of Christian revelation and faith; various theological disciplines and their interconnectedness; meaning of spirituality; different aspects of spirituality - Biblical Studies, Liturgy, Pastoral theology. Systematic theology, Church history, Ethics and Virtues and African theology -; rise and development of monasticism and modern Spirituality; overview of the history of Christian Spirituality; Christian virtues and universal application of charity, chastity, poverty and obedience, spiritual retreats.

Objectives

The objectives of the course are to:

1. **explain** the nature of Moral Philosophy, that is, what Moral Philosophy is all about;
2. **identify** the constitutive elements of Moral Philosophy spiritual;
3. **state** the central thesis of Moral Philosophy;
4. **relate** to moral life in a way that gives meaning and purpose to the exercises a person performs;
5. **discuss** variety of acceptable life styles in the Catholic Church;

Learning outcomes

On completion of the course, students should be able to:

1. **Understand** the characteristics of various ways of life in the Catholic Church;
2. **Discuss** overview of the history of Christian Spirituality
3. **Establish** the relevance of the practice of virtue and exercise of moral principles in the contemporary world;
4. **Confront** intelligently the discourse of LGBTQ+

5. **Strengthened** to live moral life.

Course Content

Nature of theology as a rational account and systematic reflection on the meaning and content of Christian revelation and faith; instruments at the disposal of spiritual theology – word of God, sacraments and continuous struggle in the Christian life; various theological disciplines and their interconnectedness; meaning of spirituality; different aspects of spirituality - Biblical Studies, Liturgy, Pastoral theology. Systematic theology, Mystical theology, Church history, Ethics and Virtues and African theology - ; rise and development of monasticism and modern Spirituality; Vatican 11 Spirituality; overview of the history of Christian Spirituality; Christian virtues and ethic, universal application of charity, religious life and spiritual retreats.

Minimum Academic Standards

Books (E-books inclusive), Journals, Encyclicals,
Computer with internet connectivity.

DUI-CST I07: CATHOLIC CHURCH AND THE SOCIETY (2 Units C: LH 30)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the University

The Catholic Church is an organisation that takes its social role seriously. Though divine, it is human both in nature and operations. Its members are global citizens who must also relate with other individuals and corporate entities who come from diverse backgrounds. As Mother, the Catholic Church reserves the right to take care of not just its own members, but also others of other faiths who have come to look up to it for protection, direction and leadership in many issues of the world. Consequently, the Church over the years has put up a series of teachings to guide and guard social relations in the world. These social teachings have contributed immensely to provide justice, development and peace between individuals, bodies and nations. Knowledge of these social teachings will therefore imbue graduates of the course with the

requisite information to promote the social teachings of the Church in whatever context or capacity they operate. This goal promotes the vision of the DUI to form graduates who will possess multiple skills and competences that will benefit both the local and international communities of the world.

Overview

Since the Church does not restrict itself to spiritual matters alone but concerns itself with the entire human wellbeing, the course therefore examines the efforts of the Church as pastor of the material wellbeing of human persons, with special emphasis on human dignity and rights. It is concerned with human dignity and the common good in society. It addresses oppression, the role of the state, subsidiary, social organization, social justice and wealth distribution. According to Pope John Paul II, The foundation of social justice rests on the threefold cornerstones of human dignity, solidarity and subsidiarity. It is built on a commitment to the poor, which arises from experience of Christ in the Eucharist and its roots can be traced to Catholic theologians such as Thomas Aquinas and Augustine of Hippo.

Objectives

The objectives of the course are to:

1. **reveal** the effort of the Catholic Church in its social justice ministry platform locally and globally;
2. **know** that the Catholic Church's evangelization activities include social wellbeing of human persons;
3. **Know** that there is no dichotomy between faith and practice in the Catholic Church;
4. **aware** of the wealth of knowledge about the involvement of the Church in the life of the society.

Learning outcomes

On completion of the course, students should be able to:

1. **discuss** many of the issues pertinent to the concern of the church and society

2. **understand better** the working of the Catholic Church in society**;**
3. **live and witness** to the content and challenges of the social teaching of the Church
4. **explain** main concepts of expression in the language the Church uses in its discourse on issues of church and society

Course Content
Human dignity; integrity of creation; the common good in society; the role of government in the state; civil society; nongovernmental organizations; Human rights and Responsibilities; Economy Justice; Global Solidarity; Preferential option for the Poor and Venerable; Participation in the life of the Society; Promotion of Peace and Justice; Critique of the social ministry of the church in society.

Minimum Academic Standards
Books (E-books inclusive), Journals, Encyclicals, works of Pope John Paul 11, St Thomas Aquinas and Augustine of Hippo)
Computer with internet connectivity.

DUI-CMP 202: VISUAL PRESENTATIONS FOR EFFECTIVE COMMUNICATION (2 Units, Compulsory; LH 15, PH 45)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university
Equipping our graduates with visual presentation and video editing skills significantly boosts their relevance, creativity, and innovative potential. This investment in practical, creative skills directly reflects Dominican University Ibadan's commitment to developing versatile, self-reliant leaders with diverse innovative competencies prepared for service in Nigeria and global success.

Overview
The human brain processes information more effectively with visual cues. Simple slides featuring images, charts, or brief statements help

an audience grasp key messages. Conversely, an overabundance of slides, or those cluttered with excessive text or complexity, becomes counterproductive. The audience's attention shifts from listening and connecting with the speaker to deciphering the visuals.

This underscores why effective visual presentation is such a vital skill. A compelling visual presentation can be the key to convincing stakeholders, winning new clients, or inspiring action from colleagues. It achieves this by creating positive engagement and clarity, ensuring the audience remains connected and receptive, rather than bored or confused, making the core message truly stick.

Objectives

The objectives of the course are to:

1. **Explain** the fundamentals of effective visual presentation**.**
2. **Demonstrate** the various visual aids and how to use them effectively.
3. **Demonstrate** how to use Microsoft PowerPoint.
4. **Conduct** practical exercises with Microsoft PowerPoint.
5. **Demonstrate** how to use Microsoft PowerPoint to enhance visual appeal.

Learning outcomes

On completion of the course, the student should be able to:

1. **Describe** the dos and don'ts of effective visual presentations.
2. **Create** engaging and passionate presentations like those done in TEDx;
3. **Use** powerful visual aids to elaborate their presentations;
4. **Use** data visualizations for communicating findings and opinion polls;
5. **Create** and use slides, whiteboards, academic posters, handouts, etc.
6. **Create** and format Microsoft PowerPoint Slides and use Presenter Notes in PowerPoint; and
7. **Demonstrate** how to record a PowerPoint presentation with a screen capture.

Course contents
Effective visual presentation. Creating engaging and passionate presentations to convince and sell ideas. Powerful visual aids and how to use them. Simplicity, elegance and consistency as essential ingredients. Some applications to use for effective visual presentations. Some types of visual presentations and how to use them effectively: slides, charts, whiteboards, videos, infographics, academic posters and paper handouts. Slide layouts, presenter view, slides, master slide. Choosing a theme (choosing preloaded Microsoft themes). Formatting slides (using different colours and fonts, changing slide background). Working with slides (adding and deleting, rearranging slides and sections). Visual boosts (insert picture/clipart/ images/diagrams/ charts and adding transitions, adding animation and inserting videos and hyperlinks). Making notes under slides and saving. Review and deliver presentation (previewing and printing handouts). Delivering a presentation. Presenting a difficult and complicated idea to convince people to buy into it, using only Microsoft PowerPoint.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. For example, those in accounting can be taught how to effectively use PowerPoint to present an end-of-year accounting report, while those in Business Administration can be taught how to use it effectively in pitching a business, etc. The emphasis should be on practical application; the students should be taught how to do that, more than just the generic features of the application.

Minimum Academic Standards
Computers (1:3 students).
Software (Microsoft PowerPoint, Visio).

DUI-CIE 201: INTRODUCTION TO CREATIVITY AND INNOVATION (2 Units: C, LH 15, PH 45)
Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university

Leaders of organisations globally demand creative and innovative employees to drive their organisational goals and objectives. Despite creativity being an essential life skill, it is not appreciated and utilised by everyone. Yet, research and practice consistently prove that it could be nurtured. Consequently, the introduction to creativity and innovation in computer science course is geared towards producing graduates who will be deliberately creative and innovative. This objective is in line with the DUI's vision of producing graduates who will be leaders with multiple competences that will serve Nigeria and the global human community that is constantly in need of creative and innovative leaders who will deal with the complex challenges of our contemporary world. Consequently, students will be able to utilise their computer science training with creative and innovative behaviours. Students will therefore be prepared to be major players in the ICT world.

Overview

This course introduces the students to the science of creativity and innovation. The students are introduced to the lingo of deliberate creativity. They begin to experience the mind shift that is necessary to foster, promote and sustain creative and innovative behaviour. This is done by a deliberate immersion of the students into the creative and innovation process through practical exercises in and outside of class. Further, students learn the creative process through the 4Ps of creativity namely; person, product, process and press (context) of creativity.

From the above, a creative and innovative attitude is deliberately cultivated in the students. The course achieves this by their imbibing the traits, mindset and other predispositions to creativity and innovation. The attempt to nurture creative and innovative skills is made present within the context of their computer science training. Consequently, while engaging in their ICT pursuits, the students are able to display both creative and innovative skills that will become an integral part of their lives forever.

Objectives

The objectives of the course are to:

1. **Develop** the creative attitude necessary for survival in the 21st century.
2. **Foster** in the sophomores, the spirit of deliberate creativity and innovation.
3. **Use** the basic tools of the creative problem solving process.
4. **Adapt** the creative and innovative tools learnt to solve problems in the ICT.
5. **Develop** the creative and innovative skills applicable to development of Apps and Programmes.

Learning Outcomes

On completion of the course, students should be able to:

1. **Discuss** the nature of change.
2. **Explain** the meaning of creativity and innovation.
3. **Explain** the place of creativity and innovation in Computer Science.
4. **Describe** the creative and innovative process
5. **Discuss** some models/schools of thought of creativity and innovation.

Course Contents

The Change Discourse. Nature of Creativity. Nature of Innovation. Understanding the Creativity and Innovation Connection. Examining Creative Expressions within Computer Science. Models/ Schools of Creativity and Innovation. Brainstorming. The Creative Problem Solving Process. Divergent Thinking Techniques. Convergent Thinking Techniques. Brainwriting. Psychoticism. Mind Mapping. Psychology of Creativity. Story Boarding for Programme Development. Point for Evaluating Applications. Facilitating Problem Solving Processes in Computer Science.

Minimum Academic Standards

Sticky Notes, Pipe Cleaners, Smart Board, Laptop, Legos, Projector, Makers, Textbooks, Manuals, Timer, Flip Charts

DUI-CMP 204 BASIC USE OF COMPUTERS AND OFFICE APPLICATIONS (2 Units: C, LH 15, PH 45)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university

Dominican University Ibadan is committed to developing innovative, self-sufficient leaders poised for service in Nigeria and success worldwide. Central to this mission is fostering computer proficiency, as technology drives creativity and innovation. Therefore, this computer science course is intentionally structured to enhance students' imaginative abilities, equipping them with the skills and mindset envisioned by the University.

Overview

Recognizing the necessity of digital skills in the information age, this course comprehensively introduces essential technologies.

- Foundational Concepts: Students will grasp basic technology concepts, defining terms like computer, internet, web, and understand hardware, software, networks, and computer types.
- Operating System Navigation: Practical training focuses on Windows Explorer, including logging in, navigating the desktop, managing files, folders, windows, and user accounts, and updating system files.
- Security & Maintenance: Emphasis is placed on computer security and privacy, covering virus protection, preventing unlawful access, creating secure passwords, password recovery, basic troubleshooting, and system maintenance techniques.
- Advanced Office Application Proficiency: Beyond basics, the course aims for intermediate to advanced mastery of Microsoft Word, Excel, and Visio. This includes sophisticated tasks like using Word to create indexes and format documents with multiple sections, distinct headers/footers, and varied page layouts.

Objectives

The objectives of the course are to:

1. **Describe** the various aspects of computers, the internet, and computer networks.
2. **Understand** and use Microsoft Windows efficiently and securely with basic troubleshooting abilities.
3. **Demonstrate** the use of Microsoft Word.
4. **Demonstrate** the use of Microsoft Excel.
5. **Demonstrate** the use of Microsoft Visio.

Learning outcomes

On completion of the course, the student should be able to:

1. **Define** basic computer terms, such as computer, user, hardware, software, internet, etc., and identify the various computer types.
2. **Identify** the various types of hardware and software and explain their purpose.
3. **Describe** computer networks and their related connection devices.
4. **Explore** the desktop, update system files, manage user accounts, display windows, and manage folders and files in Windows OS
5. **Perform** basic computer troubleshooting and system maintenance
6. **Create,** edit and proofread a Microsoft Word document using track changes.
7. **Use** and modify Microsoft Excel workbooks and worksheets and create simple diagrams on Microsoft Visio.

Course contents

Introduction to information and communication technology. Types of computers. Computer hardware and software. Computer networks: types of networks; connection devices (Wi-Fi Routers, Modems, LAN Cables). Exploring Windows OS. Viruses, unlawful access, and system failure; secure passwords and password recovery; enhancing computer security and privacy. Basic troubleshooting techniques and system maintenance. Exploring Word: formatting text, finding and replacing text, correcting errors; organising information in columns and tables; adding page numbers,

header and footer; adding pictures and changing a document background. Working with references: creating and modifying auto-generated table of contents; inserting and modifying citations and changing from one referencing style to another, inserting and modifying tables of figures, captions and cross-referencing. Some intermediate tasks with Word: inserting and modifying Index; working with section breaks. Producing a simple and aesthetic newsletter for a think-tank group using only Microsoft Word. Exploring Excel: creating and modifying workbooks and worksheets. Working with data: basic calculations and formulas. Creating and editing charts and mail merge. Producing a simple account-reporting template for a think-tank group using only Microsoft Excel. Using Microsoft Visio for creating various diagrams and visual aids, such as organograms, pyramids, flowcharts, etc. Producing a simple and efficient organogram of a think-tank group using only Microsoft Visio.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. For example, in teaching Excel, emphasis can be made on some formulas that the Accounting Department can use for their work, etc.

Minimum Academic Standards
Computers with internet connectivity (1:3 students).
Software (Windows OS, Microsoft Word, Microsoft Excel, Microsoft Visio).

DUI-CMP 302: SURVEY OF PROGRAMMING LANGUAGES (3 Units: C, LH 30, PH 45)
Senate-approved relevance to vision, mission, strategic goals, uniqueness and contextual peculiarities of the university
Good programming dexterity is a skill that is becoming increasingly sought after in the job market. Becoming a good programmer requires patience, attentiveness and careful understanding of the suitability of different programming languages created to solve practical and diverse problems. Developing and understanding good

programming skills while ensuring that the solutions proffered are ethical would position the Dominican University computer science graduates on a high pedestal of importance, creativity and Innovation. This is in line with the vision of Dominican University Ibadan, which is to form a new generation of leaders with multiple creative and innovative capabilities with self-reliant skills.

Overview

Over the years, thousands of programming languages have been designed. Each programming language being suited for different environment/ problem. Having at least a basic understanding of how software functions is helpful for anyone who interacts with technology. With a good background in programming, anyone can get a job coding, designing software, data architecture, or creating intuitive user interfaces.

With the field of technology growing exponentially each year, one may wonder which programming language to learn. It is therefore, imperative that students study the different programming language paradigms, their feature and peculiarities. This will enable them choose the correct programming language that is best suited to implement/ develop any software project.

Objectives

The objectives of the course are to:

1. **Discuss** the various programming paradigms
2. **Describe** the syntactic structure of programming languages
3. **Study** the various data types available and supported by different programming languages.
4. **Evaluate** the trade-offs between the different paradigms, considering such issues as space and time efficiency, safety, and power of expression.
5. **Demonstrate** the suitability of different programming languages in solving various real life problems.

Learning outcomes

On completion of the course, the student should be able to:

1. **Demonstrate** understanding of the evolution of programming languages and relate how this history has led to the paradigms available today.
2. **Describe** the various programming paradigms.
3. **Identify** 5 different data types supported by selected programming languages
4. **Explain** the unique features of the various programming languages.
5. **Demonstrate** increased ability to learn new languages.
6. **Practise** coding with different programming languages.

Course Contents

History of programming languages. Brief survey of programming paradigms. Brief study of Procedural languages. Brief study of Object-oriented languages. Brief study of Functional languages. Brief study of Declarative – non-algorithmic languages. Brief study of Scripting languages. The effects of scale on programming methodology. Language Description: Syntactic Structure (Expression notations, abstract Syntax Tree, Lexical Syntax, Grammars for Expressions, Variants of Grammars). Language Semantics (Informal semantics, Overview of formal semantics, Denotation semantics, Axiomatic semantics, Operational semantics). Declarations and types. The concept of types. Declaration models (binding, visibility, scope, and lifetime). Overview of type-checking. Garbage collection. Abstraction mechanisms. Procedures, function, and iterations as abstraction mechanisms. Parameterization mechanisms (reference vs. value).

Minimum Academic Standards

Software Laboratory
Computers (1:3 students)
Software e.g. (C# compiler, Java, PHP, Javascript)

DUI-CMP 304: CYBER TOOLS AND AI PROFICIENCY (2 Units: C, LH 15, PH 45)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university
Proficiency in AI, Google, and internet tools contributes to and sharpens students' research and publication skills and ensures their knowledge remains current and applicable. Developing these competencies is key to shaping the innovative, self-reliant leaders Dominican University Ibadan aims to produce – individuals ready for meaningful contributions in Nigeria and success on the global stage.

Overview
Today's internet and AI landscape demands more than basic web browsing. Knowing how to utilize these technologies to boost productivity, expand capabilities, and acquire knowledge effectively is imperative. Essential competencies include: AI usage and proficiency, adept online and mobile collaboration; efficient searching across both surface and deep web; critical evaluation of AI-generated information and web-based information for veracity and relevance; and diligent online self-protection against data breaches and privacy violations.

Furthermore, online collaboration tools enable teams to work together towards common goals through communication, coordination, and shared problem-solving, regardless of location. While proficiency with the vast array of available collaboration software enhances effectiveness, it must be paired with a strong understanding of online security. Basic knowledge of operating safely online is a fundamental necessity, not a luxury.

Objectives
The objectives of the course are to:
1. **Explain** some of the internal workings of the internet and web, and how to keep oneself safe online.
2. **Expose** the various layers of the web (surface, deep and dark web) and how one may better access them for needed information;
3. **Expose** how to use the various AI tools available today.

4. **Teach** the parameters used in evaluating the veracity and relevance of web-based information;
5. **Explain** how to use the various online collaboration tools available; and
6. **Expose** how to synchronize these online collaboration tools to one's mobile to enable working on the move.

Learning outcomes

On completion of the course, the student should be able to:

1. **Define** the Internet and related terms.
2. **Explain** how the Internet works and the nature of the World Wide Web.
3. **Utilise** browsers and search engines to find information on the surface and deep web.
4. **Demonstrate** how to use the URLs and address bar, navigation buttons, tabbed browsing, bookmarks and history, downloading and uploading, plugins, and clearing browser cache and cookies.
5. **Utilise** the various AI tools available today for productivity and efficiency.
6. **Demonstrate** how to evaluate web-based information for veracity and relevance critically.
7. **Utilise** various online collaborations in communication, documentation, file sharing, organisation, project management, etc.
8. **Demonstrate** how to synchronise online collaboration tools to the mobile environment to enable people to work on the go.

Course contents:

Defining the Internet and related terms. How the internet works and the nature of the World Wide Web. Browsers, Internet Explorer, search engines and finding information. URLs and address bar, navigation buttons, tabbed browsing, bookmarks and history. Downloading and uploading, saving and plug-ins. Internet safety: secure passwords, browser security, cookies & account tracking. Internet safety: avoiding spam & phishing, malware, & suspicious links. Web-based information: search (surface web and deep web),

critical evaluation (authority, accuracy, objectivity, currency, coverage, and purpose), copyright, & protection. Emails: creating accounts, composing, sending, and receiving mail. Emails: uploading & downloading attachments, settings, calendars, files & folders. Online collaboration: communication tools, documentation tools, file-sharing tools, organizational tools, project management tools, design tools, etc. Online collaboration: preparation for & setting up accounts. Online collaboration: calendars, meetings & learning environments. Mobile collaboration: using mobile devices & synchronisation. Cloud computing: key concepts; why use the cloud & what is Web App. The various LLM models and AI tools available today.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. For example, emphasis should be on using AI to facilitate and enhance productivity in various fields of discipline.

Minimum Academic Standards
Computers with Internet Connectivity (1:3 students).
Software (Google Workspace, Google Search, Subscription to some Collaboration Tools such as Asana, Zoom, etc., LM Studio, Ollama, Google AI Studio, ChatGPT, and various LLM models, such as DeepSeek, Llama, Gemma and Germini)

DUI-CIE 308 Creativity and Innovation For Business Success in Computer Science (2 Units; C: LH=15; PH=45)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university

CEOs have been revealed through research and practice to place a high premium on creative skills among employers globally. Business organisations that do not deliberately seek and cultivate creativity and innovation in their establishments will not survive in the highly complex global market and economy. The Creativity and Innovation for Business Success in Computer Science is designed to produce graduates who will be competent enough to apply creative

and innovative skills in their businesses, thereby ensuring the success of any venture they engage in, whether locally or internationally. This objective aligns with DUI's mission to produce graduates with multiple abilities who will facilitate business and economic success both locally and internationally. Consequently, this course will help computer science undergraduates develop the creative and innovative skills that will be applied in the ventures they create during their studies and beyond.

Overview

Teaching creativity and innovation to computer science students is vital because it helps them evolve from mere coders following instructions to architects of new solutions capable of shaping future technology. While a traditional curriculum emphasises logic and algorithms, a creative and innovative mindset allows students to recognise and address problems that lack straightforward solutions. Therefore, through this course, computer science undergraduates at DUI will develop skills in Problem Identification and Framing: the most impactful innovations often come from creatively rethinking a problem, not just solving a well-defined one. Creativity enables students to go beyond technical constraints and understand user needs, market gaps, and societal issues. While algorithms provide a logical path, creativity is crucial for designing the overall structure and user experience of a solution. It is the difference between writing code that functions and designing a system that is elegant, intuitive, and groundbreaking. This includes brainstorming new architectures, discovering unconventional data models, or designing interfaces that delight users. The field of computer science is constantly changing. New languages, frameworks, and paradigms emerge all the time. An innovative mindset helps students to be adaptable and resilient. They learn to think in terms of principles rather than specific tools, allowing them to quickly learn and apply new technologies to solve novel problems. Creativity forms the foundation of a startup. Many of the most successful tech companies were founded by individuals who identified a problem and developed a genuinely innovative, creative solution. This skill set is essential for anyone aiming to develop a new product, launch a business, or lead a team in a

competitive market. It turns technical skills into a way of creating economic and social value. The course will also promote interdisciplinary collaboration.

Objectives

The objectives of the course are to:

1. **instill** creative and innovative skills in the students for entrepreneurial success;
2. **teach** students different means of ideation for business success;
3. **identify** opportunities for entrepreneurial success in computer science;
4. **foster** deliberately, creative and innovative skills for business success in their employees;
5. **manage** any business venture successfully.

Learning outcomes

On completion of the course, students should be able to:

1. **explain** the role of creativity and innovation for business success
2. **discuss** the role of change in the pursuit of business success
3. **describe** stakeholders' role in ideation for business success
4. **discuss** the creativity, innovation and business connection in computer science
5. **evaluate** cases in the creativity and innovation business challenge

Course contents

Creativity and innovation for business success. Change and business realities. Intrinsic motivation for creativity and innovation in business. Facilitating ideation from clients. Employee training for

creativity and innovation. Creativity, innovation and Computer. Facilitating creative economic growth through Computer Science. Theories of Creativity in Computer Science. Design Thinking for technology. Idea generation (SCAMPER: Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse). Prototyping and Rapid Iteration. Creativity and AI. Computational Arts and Media. Human-Computer Interaction (HCI)

Minimum Academic Standards

Sticky Notes, Pipe Cleaners, Smart Board, Laptop, Legos, Projector, Makers, Textbooks, Manuals, Timer, Flip Charts.

DUI-CMP 306: DESKTOP PUBLISHING AND GRAPHIC DESIGN (2 Units: C, LH 15, PH 45)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university

Mastering desktop publishing and graphic design provides significant advantages, including increased productivity, reduced production costs, and the ability to customize projects rapidly and manage content effectively. These skills also enhance adaptability and offer powerful means of creative expression. By integrating this training into the curriculum, Dominican University aims to equip students with these valuable competencies. Graduates with these abilities will be distinguished by their relevance, originality, and innovative capacity, directly supporting Dominican University Ibadan's mission to develop versatile, skilled leaders ready to serve Nigeria and excel globally.

Overview

The current information age promotes a "do-it-yourself" capability, where computers and software allow individuals to handle tasks once requiring experts, thereby boosting personal productivity and employability (though expert roles persist).

Specifically, foundational knowledge in Desktop Publishing (DTP) and image editing provides a distinct advantage. DTP is the process of creating documents (brochures, cards, posters, web pages, etc.) using page layout software, focusing on the effective arrangement of visual elements. These tools enable both designers and non-designers to produce professional visual communications. Strong image editing skills are essential to complement DTP, further empowering graduates to manage their own design needs effectively.

Objectives

The objectives of the course are to:

1. **Describe** and introduce the rubrics of Desktop Publishing (DTP).
2. **Demonstrate** creating DTP tasks using ready-made templates with Microsoft Publisher.
3. **Demonstrate** how to use a template and layout using CorelDRAW.
4. **Explain** the various image formats in computers and when to use them; and
5. **Describe** and introduce some basic image editing skills using Adobe Photoshop.

Learning outcomes

On completion of the course, the student should be able to:

1. **Describe** the features of desktop publishing.
2. **Enter** and edit the text in a Microsoft Publisher template.
3. **Create** a booklet with adequately formatted text/style and page numbers.
4. **Demonstrate** how to save booklets in PDF.
5. **Demonstrate** how to print a booklet back-to-back.
6. **Publish** brochures, calendars, and invitation cards.
7. **Create** an intuitive and creative template and layout using CorelDRAW.

Course contents
Introduction to Desktop Publishing. Introduction to Microsoft Publisher and its templates formatting text, paragraphs, styles. Inserting images, page numbering and formatting. Saving projects in PDF, printing projects (back-to-back printing). Any other projects such as brochures, calendars, invitation card, greeting cards, business cards, award certificates, etc. Design a simple three-fold brochure for a think-tank group. Introduction to graphic design. Explain the various image formats in a computer environment (JPEG, PNG, GIF, WEBP, etc). Introduction to Adobe Photoshop. Edit an image: cropping, resizing, rotating and transformation. Cropping off backgrounds and blending images together. Create a simple logo for a think-tank group. Introduction to CorelDraw. Page setup and layout in CorelDraw. Using of shapes, joining shapes and embedding images inside shapes. Text alignment, arrangement and fitting to paths. Create a newsletter for a think-tank group, using CorelDraw only.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. The emphasis should be on using these applications to create documents peculiar to each department.

Minimum Academic Standards
Computers (1:3 students).
Software (Microsoft Publisher, Adobe Photoshop, CorelDRAW).

DUI-CST 303: ETHICS IN CONTEMPORARY TIMES (2 Units, C, L 30)
Senate approved relevance to Vision, Mission, Strategic Goals, Uniqueness and Contextual Peculiarities of the University
Graduating students with sound character and robust competences in diverse fields and areas of human endeavour is in tandem with the vision and mission of the Dominican University. In producing graduates for service in Nigeria and the global community, the

Dominican University envisions excellence of character as the hub around which the training of its students in quality computer science education revolves. Since sound character is the vehicle that drives competence for optimal effectiveness in problem solving, creating an excellent moral atmosphere in the University will help the Dominican University in her commitment to form a new generation of leaders at the service of Nigeria and the global community, leaders who will use the multiple competence acquired in this University to work for their own good by serving the common good. Here at the Dominican University, we intend to produce computer science graduates and also begin the building of generations of computer scientists that will be alert to and consider conscientiously, the societal impact of their activities and the possible impact their work can have on human lives and on the common good.

Overview

This course is designed to supply the much needed moral substructure upon which the superstructure of robust competences in Computer Science can be built. There is hardly any facet of human existence that does not throw up ethical issues. Dealing with these issues can be quite daunting even for specialists in different fields of knowledge especially when there is a shift of focus from the question of the potentials of a particular specialization to the question of whether what a specialization offers at a particular point is promoting human flourishing and the common good or causing harm. In other words, value judgements constitute an inextricable part of the judgements students and graduates of Computer Science are called to make even in the face of the scientific and technological prowesses of Computer Science.

Ethics of Computer Science will help to train students to think not only about what systems they could build or programs they can design, but to also think about whether they should or ought to build a particular system or design a particular program. Of course, it is not the case that an ethical mindset can only be prohibitory, that is, preventing a computer scientist from building systems or designing

programs that could cause harm. An ethical frame of mind can also be prescriptive, that is, mandating the computer scientist to work in order to build systems or design programs that can benefit humanity.

Objectives

The objectives of the course are to:

1. **Define** the nature of ethics and its relevance to Computer Science;
2. **Illustrate** the importance of an ethical frame of mind for the students and graduates of Computer Science;
3. **State** the prevalent ethical theories implicated in ethical assessments in contemporary ethical situations namely, virtue ethics, duty theories and consequentialist theories;
4. **Analyse** the principles of beneficence and nonmaleficence in the practice of computer scientists; and
5. **Discuss** ethical principles in Computer Science.

Learning Outcomes

On completion of the course, students should be able to

1. **Explain** the nature of ethics and its relevance to Computer Science.
2. **Distinguish** between ethics of Computer Science and Professional ethics in Computer Science.
3. **State** the traits of moral principles.
4. **Describe** the domains of ethical assessment.
5. **Demonstrate** knowledge of important ethical systems.
6. **Construct** sound ethical arguments with regard to ethical issues that arise in the work of computer scientists.
7. **Integrate** virtues in character formation of computer scientists.

Course Contents

Introduction to ethics and its subdivisions. Analysis of why the computer scientist ought to be moral. Nature (traits) of moral principles. Domains of ethical assessment. Introduction to the ethics of computer science. Professional ethics in computer science. Freedom and moral responsibility. Notion of the common good.

Moral relativism. Moral objectivism. Some ethical theories - deontologism consequentialism, virtue theory. Ethical issues in computer science (hacking, intellectual property, privacy, data collection, algorithmic bias) Ethics and ICT professionals. Artificial Intelligence and ethics. Robotics and ethics. Computer games and ethics. Virtual reality (virtual identity) and ethics

Minimum Academic Standards
A standard classroom. Software Laboratory. Computers (1:2 students). A functional email account

DUI-CMP 402: INTRODUCTION TO MACHINE LEARNING (3 Units: C, LH 45)
Senate-approved relevance to vision, mission, strategic goals, uniqueness and contextual peculiarities of the university
As technology advances and sophisticated devices are built, then these devices, sometimes called machines have to learn from large datasets to predict certain behaviours or trends. This industry is rapidly ever-changing and is full of new technologies, tools, software frameworks, large datasets, and innovative ideas. Keeping up-to-date with the latest trends in technology would position the Dominican University computer science graduates on a high plinth of relevance, creativity and Innovation. This is in line with the vision of Dominican University Ibadan, which is to form a new generation of leaders with multiple innovative competences and up-to-date skills that will serve Nigeria and enable them have great opportunities anywhere in the whole of the world. It means ensuring that they keep their eyes on the future to know which skills they will need to secure a safe job tomorrow, and even learn how to get there.

Overview
Machine learning is a subfield of computer science that is concerned with building algorithms which, to be useful, rely on a collection of examples of some phenomenon. Machine learning can also be defined as the process of solving a practical problem by gathering a dataset, algorithmically building a statistical model based on that

dataset. That statistical model is assumed to be used somehow to solve the practical problem.

This course covers theory and practical algorithms for machine learning from a variety of perspectives. The Prerequisite courses are Fundamental Data Structures and Algorithms, Principles of Programming.

Objectives

The objectives of the course are to:

1. **Describe** the concept of Machine Learning;
2. **Discuss** various types of Learning (Supervised learning, Unsupervised learning, Semi-Supervised learning, and Reinforcement learning;
3. **Practice** machine learning algorithms like Regression, Decision Tree Learning, Support Vector Machine K-Nearest Neighbours;
4. **Introduce** students to Neural Networks and deep learning;
5. **Practice** dealing with noise in data and Inherent non-linearity;
6. **Practice** machine learning with datasets.

Learning outcomes

On completion of the course, the student should be able to:

1. **Describe** main concepts in machine learning.
2. **Discuss** and describe working with datasets prior to building algorithms.
3. **Practise** with learning algorithms on various dataset.
4. **Differentiate** among learning algorithms and their optimal application areas..
5. **Design** deep learning architecture for testing with real datasets
6. **Evaluate** the suitability of available learning algorithm in real life situations.

Course Contents

This course is structured into modules. Module 1 - Supervised vs Unsupervised Learning. Machine Learning vs Statistical Modelling. Supervised vs Unsupervised Learning. Module 2 - Supervised

Learning I - K-Nearest Neighbours, Decision Trees, Random Forests, Reliability of Random Forests. Advantages & Disadvantages of Decision Trees. Module 3 - Supervised Learning II - Regression Algorithms, Model Evaluation. Model Evaluation: Overfitting & Underfitting. Understanding Different Evaluation Models. Module 4 - Unsupervised Learning- K-Means Clustering plus Advantages & Disadvantages. Hierarchical Clustering plus Advantages & Disadvantages. Measuring the Distances Between Clusters - Single Linkage Clustering. Measuring the Distances Between Clusters - Algorithms for Hierarchy Clustering. Density-Based Clustering. Module 5 - Dimensionality Reduction & Collaborative Filtering. Dimensionality Reduction: Feature Extraction & Selection. Collaborative Filtering & Its Challenges. Neural Networks and Deep learning models.

Minimum Academic Standards
Software Laboratory. Computers (1:3 students). Software e.g. (Python)

DUI-CMP 406: SOCIAL MEDIA PROFICIENCY, BASIC VIDEO EDITING & WEB TRAFFIC ANALYTICS (2 Units: C, LH 15, PH 45)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university
The development of social media skills would put our computer science graduates on a high pedestal of relevance, originality, and innovation while also guaranteeing that the contents of their communication are ethical. This is in keeping with Dominican University Ibadan's mission to develop a new generation of leaders who would serve Nigeria and the entire world and possess a wide range of innovative competencies.

Overview
There is this widespread misconception among the 'older' generation that social media is for unserious business or lazy youth. Yet, the success or failure of big businesses has been determined sometimes by their social media engagements. Social media have played a vital

role, sometimes, in the direction of political elections of countries. Many other benefits of social media can be listed.
Consequently, proficiency in the use of social media and the ability to analyse, interpret and react to pattern changes on these social media is a fundamental tool for productivity and capacity in our today's ICT world. This course aims at empowering our graduates to have this added advantage as they go into the wider society. Their prior knowledge of photo and video editing would be necessary here.

Objectives
The objectives of the course are to:

1. **Demonstrate** the importance of web presence and positive social media engagements for groups and organisations;
2. **Teach** how to efficiently engage the various social media to achieve set goals;
3. **Explore** how to use Google Analytics and other analytical tools to monitor pattern changes in social media and measure conversion rates; and
4. **Explain** how to use Google Tag Manager to track events on social media and other online presence.

Learning Outcomes
On completion of the course, the student should be able to:

1. **Use** Facebook/Instagram to create website layouts and designs.
2. **Demonstrate** how to add content to web site page banner.
3. **Demonstrate** how to add followers, follow them and respond to them.
4. **Demonstrate** how to add other page administrators.
5. **Use** TikTok to achieve set goals.
6. **Demonstrate** how to Link to Facebook, Twitter, and TikTok communities, and post once to Instagram, Facebook, Twitter, and TikTok groups.
7. **Use** and manage WhatsApp groups to communicate efficiently.
8. **Use** Google Analytics 4 (GA4) effectively.

9. **Demonstrate** how to track Conversions in GA4.
10. **Use** Google Tag Manager effectively.
11. **Use** other analytical tools on social media effectively.

Course Contents
Introduction to social media: Logging & Using Facebook, Twitter, Instagram, Instant Messaging & Video Chats. Ethics (What to Post, Proper Conduct & Netiquette). Privacy & Security (Who Can View Pages & Other Restrictions). Web Presence via Facebook: Creating Page Layout & Site Designs. Adding Content, Pictures, Documents, Events & Facebook Live. Boosting Posts, Sharing Posts, Hash Tags & Tagging Boosting Posts, Sharing Posts, Hash Tags & Tagging. Introduction to Adobe Premiere Rush. Simple Video Editing skills: Clipping Video, joining videos together, Adding Texts, Logos, etc. Introduction to Google Analytics. Setting Up Google Analytics 4 (GA4). How to create Filtered views in GA4. Tracking Conversions in GA4. Measuring Protocol in GA4. Introduction to Google Tag Manager. Introduction to other Analytical Tools on Facebook, Twitter, etc for tracking web traffic.

Minimum Academic Standards
Computers with Internet Connectivity (1:3 students)

DUI-CST 407: APPLIED ETHICS IN PROFESSIONAL PRACTICE (2 Units: C, L 30)
Senate approved relevance to Vision, Mission, Strategic Goals, Uniqueness and Contextual Peculiarities of the University
The Dominican University is committed to producing graduates who are scientifically, technically and morally competent. Building an ethical habit of mind that can be applied critically and constructively to different ethical issues that arise in professional practice in Computer Science is in line with the vision and mission of the Dominican University. It is also in harmony with the Dominican University's philosophy that authentic development is centred on the human person and is the outcome of artistic, technical and ethical competence, research and teaching that bring together valid achievements of the past and the best accomplishments of the

present, and recourse to traditional African values that point to ways of overcoming contemporary challenges. Applied Ethics in Professional Practice underscores the importance of ethical competence and recourse to traditional African values in the quest for authentic human evolution and the meeting of contemporary developmental challenges through professional practice in Computer Science. The relevance of this course is seen in graduates of Computer Science from the Dominican University being able to apply the tools of ethics to specific domains in Computer Science which have ethical implications, with a view to determining the rightness or wrongness of the activities within those specific domains especially in professional practice.

Overview

This course is designed to expand and strengthen the capacity of Dominican University Computer Science graduates to critically assess ethical issues that emerge in the discipline and practice of computer science by paying particular attention to specific domains that have contemporary ethical relevance in computer science. Thus, there will be a close consideration of actual or possible cases in professional practice of the computer scientist.

Contemporary society is suffused with morally controversial issues arising in different fields of knowledge and in the professional practice of graduates in these fields of knowledge. Graduates who are not trained in ethics are not able to critically and constructively evaluate these controversial issues often leading to a failure to either refrain from practices that can cause harm or advance certain practices that can improve the quality of life. This course aims at overcoming that lack of training in sound ethical reasoning that can be applied to specific ethical issues.

Objectives

The objectives of the course are to:

1. **Recall** important ethical theories.
2. **Identify** latent ethical situations in professional practice of the computer scientist.
3. **Analyse** specific ethical situations in computer science.

4. **Demonstrate** sound ethical reasoning.
5. **Apply** ethical theories and ethical reasoning to specific moral situations.

Learning outcomes

On completion of the course, students should be able to:

1. **Define** applied ethics.
2. **Illustrate** the relevance of applied ethics to the professional practice of the computer scientist.
3. **Identify** ethical issues that arise in the professional practice of the computer scientist.
4. **Evaluate** the main arguments and positions on contemporary controversial moral issues in computer science.
5. **Distinguish** between moral issues and non-moral issues in professional practice.
6. **Construct** sound ethical arguments and views on relevant applied issues.
7. **Demonstrate** an ethical mindset conducive to professional practice of the computer scientist.

Course contents

Introduction to applied ethics. Review of ethical theories - virtue theory, deontologism, consequentialism. The computer scientist as a moral agent. Constructing moral arguments. Rights in applied ethics. Hacking. Intellectual property. Privacy. Data collection. Algorithmic bias. Artificial Intelligence. Robotics. Deep fakes. Disruptive technology. Virtual reality. Computer games. Autonomous things. Cybernetics

Minimum Academic Standards

Standard classroom.
Software laboratory
Computers (1:2 students)
Functional email account

DUI-CIE 401: ORGANISATIONAL MANAGEMENT OF CREATIVITY AND INNOVATION (2 Units: C, LH 15, PH 45)

Senate-approved relevance to the vision, mission, strategic goals, uniqueness and contextual peculiarities of the university

Human beings operate within organisations. Each of these organisations periodically face challenges. The 21st century challenges faced by individuals and organisations are very complicated. Resolving these challenges needs dynamic persons with multidimensional competences. This course, Organisational Management of Creativity and Innovation in Computer Science aims at grooming change agents/leaders who will initiate, promote and sustain creative and innovative behaviours in their organisations for organisational goals and objectives. They will thus be exposed to the principles and methods of organisational management of creativity and innovation. This goal is in sync with the vision of DUI to form multi skilled graduates who will lead organisations in and outside of Nigeria for organisational objectives through the application of creative and innovative skills. Computer science students will then be able to apply what is learnt as they strive to become organisational leaders and change managers.

Overview

Creative and Innovative skills make those who possess them leaders. However, they at times lose out on their creative and innovative expressions because of the mismanagement of their creative and innovative skills. This course will therefore help to impart creative leadership skills in the students to help them facilitate creative and innovative skills for their individual and organisational advantage. Moreover, creators and innovators are change managers. These change managers need to properly initiate creative and innovative ideas for optimal advantage to persons, groups and organisations. Students will therefore be imbued with the ability to manage creative and ICT issues without conflicts.

Since Creatives and Innovators are change managers, this course is designed to empower the students to learn from various models of creativity and innovation for organisational development. These models will facilitate their practical understanding of the innovative

process for the benefit of stakeholders and their organisations. The students will be able to manage change for the 21st century complexities. This management of change will include the ability to communicate the change initiated for sustainability and organisational objectives. As computer science students therefore, this course will facilitate a creative and innovative interrogation of ICT.

Objectives

The objectives of the course are to:

1. **Discuss** different models of creativity and innovation to aid the management of the same constructs.
2. **Develop** creative leadership skills early in the students.
3. **Facilitate** the skill of communicating change in any organisation.
3. **Manage** creative and innovative issues in philosophy for organisational benefits.
4. **Model** good organisational behaviour in the students.
5. **Develop** the skills to become change agents in the world.

Learning Outcomes

On completion of the course, students should be able to:

1. **Explain** the meaning of management and leadership.
2. **Explain** the connection between management and leadership.
3. **Discuss** the challenges involved in Computer Science, creativity and innovation.
4. **Discuss** the issues involved in change, organisational creativity and innovation.
5. **Analyse** the different models/systems for managing creativity and innovation

Course Contents

Nature of Management. Nature of Leadership. Change. Change Management. The Creative, Innovator as a Change Manager/Agent. Communicating Change, Creativity and Innovation. Creativity Leadership for Change and Innovation. The FourSight Model of Managing the Innovation Process. Managing the Clarifiers.

Managing the Ideators. Managing the Implementers. Managing the Developers. Biomimicry-Innovation from Nature. Lean Start-up Innovation Model. Issues in the Lean Start-up Innovation Model. Issues in Creativity, Innovation and Computer Science. Computer Science in the Management of Creativity and Innovation. Computer Science and Biomimicry.

Minimum Academic Standards

Sticky Notes, Pipe Cleaners, Smart Board, Laptop, Legos, Projector, Makers, Textbooks, Manuals, Timer, Flip Charts

COURSE CONTENTS AND LEARNING OUTCOMES

100 LEVEL (FIRST SEMESTER)

(1) GST 111: COMMUNICATIONS IN ENGLISH (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify possible sound patterns in English language;
2. list notable language skills;
3. classify word formation processes;
4. construct simple and fairly complex sentences in English;
5. apply logical and critical reasoning skills for meaningful presentations;
6. demonstrate an appreciable level of the art of public speaking and listening; and
7. write simple and technical reports.

Course Contents

Sound patterns in English Language (vowels and consonants, phonetics and phonology). English word classes (lexical and grammatical words, definitions, forms, functions, usages, collocations). Sentence in English (types: structural and functional, simple and complex). Grammar and Usage (tense, mood, modality and concord, aspects of language use in everyday life). Logical and Critical Thinking and Reasoning Methods (Logic and Syllogism, Inductive and Deductive Argument and Reasoning Methods, Analogy, Generalisation and Explanations). Ethical considerations, Copyright Rules and Infringements. Writing Activities: (Pre-writing, writing, post writing, editing and proofreading; brainstorming, outlining, paragraphing. Types of writing, Summary, Essays, Letter, Curriculum Vitae, Report writing, Note making, etc. Mechanics of writing). Comprehension Strategies: (Reading and types of Reading, Comprehension Skills, 3RsQ). Information and Communication Technology in modern language learning. Language skills for effective communication. Major word formation processes. Writing and reading comprehension strategies. Logical

and critical reasoning for meaningful presentations. Art of public speaking and listening. Report writing.

(2) COS 101: INTRODUCTION TO COMPUTING SCIENCES (3 Units C: LH 30; PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. explain basic components of computers and other computing devices;
2. describe the various applications of computers;
3. explain information processing and its roles in the society;
4. describe the Internet, its various applications and its impact;
5. explain the different areas of the computing discipline and its specializations; and
6. demonstrate practical skills on using computers and the internet.

Course Contents

Brief history of computing. Description of the basic components of a computer/computing device. Input/Output devices and peripherals. Hardware, software and human ware. Diverse and growing computer/digital applications. Information processing and its roles in society. The Internet, its applications and its impact on the world today. The different areas/programs of the computing discipline. The job specializations for computing professionals. The future of computing.

Lab Work: Practical demonstration of the basic parts of a computer. Illustration of different operating systems of different computing devices including desktops, laptops, tablets, smart boards and smart phones. Demonstration of commonly used applications such as word processors, spreadsheets, presentation software and graphics. Illustration of input and output devices including printers, scanners, projectors and smartboards. Practical demonstration of the Internet and its various applications. Illustration of browsers and search engines. How to access online resources.

(3) MTH 101: ELEMENTARY MATHEMATICS I (Algebra and Trigonometry) (2 Units
C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. explain basic definition of Set, Subset, Union, Intersection, Complements and use of Venn
1. diagrams;
2. solve quadratic equations;
3. solve trigonometric functions;
4. identify the various types of numbers; and
5. solve some problems using Binomial theorem.

Course Contents

Elementary set theory, subsets, union, intersection, complements, Venn diagrams. Real numbers; integers, rational and irrational numbers, mathematical induction, real sequences and series, theory of quadratic equations, binomial theorem. Complex numbers; algebra of complex numbers; the Argand diagram. De-Moivre's theorem, nth roots of unity. Circular measure, trigonometric functions of angles of any magnitude, addition and factor formulae.

(4) MTH 102: ELEMENTARY MATHEMATICS II (Calculus) (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. distinguish types of rules in Differentiation and Integration;
2. describe the meaning of Function of a real variable, graphs, limits and continuity; and
3. solve some applications of definite integrals in areas and volumes.

Course Contents

Function of a real variable, graphs, limits and idea of continuity. The derivative, as limit of rate of change. Techniques of differentiation. Extreme curve sketching; Integration as an inverse of

differentiation. Methods of integration, Definite integrals. Application to areas, volumes.

(5) PHY 101: GENERAL PHYSICS I (Mechanics) (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. identify and deduce the physical quantities and their units;
2. differentiate between vectors and scalars'
3. describe and evaluate motion of systems on the basis of the fundamental laws of mechanics;
4. apply Newton's laws to describe and solve simple problems of motion;
5. evaluate work, energy, velocity, momentum, acceleration, and torque of moving or rotating objects;
6. explain and apply the principles of conservation of energy, linear and angular momentum;
7. describe the laws governing motion under gravity; and
8. explain motion under gravity and quantitatively determine behaviour of objects moving under gravity.

Course Contents

Space and time. Units and dimension, Vectors and Scalars, Differentiation of vectors. Displacement, velocity and acceleration. Kinematics. Newton laws of motion (Inertial frames, Impulse, force and action at a distance, momentum conservation). Relative motion. Application of Newtonian mechanics. Equations of motion. Conservation principles in physics, Conservative forces, conservation of linear momentum, Kinetic energy and work, Potential energy, System of particles, Centre of mass. Rotational motion. Torque, vector product, moment, rotation of coordinate axes and angular momentum. Polar coordinates. Conservation of angular momentum. Circular motion. Moments of inertia, gyroscopes and precession. Gravitation: Newton's Law of Gravitation, Kepler's laws of planetary motion, Gravitational potential energy, Escape velocity, Satellites motion and orbits.

(6) PHY 107: GENERAL PRACTICAL PHYSICS I (1 Unit C: PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs; and
5. draw conclusions from numerical and graphical analysis of data.

Course Contents

This introductory course emphasizes quantitative measurements, the treatment of measurement errors and graphical analysis. A variety of experimental techniques should be employed. The experiments include studies of meters, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity etc., covered in PHY 101 and PHY 102. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

(7) STA 111: DESCRIPTIVE STATISTICS (3 Units C: LH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. explain the differences between permutation and combination;
2. explain the concept of random variables and relate it to probability and distribution functions;
3. describe the basic distribution functions; and
4. explain the concept of exploratory data analysis.

Course Contents

Permutation and combination. Concepts and principles of probability. Random variables. Probability and distribution functions. Basic distributions: Binomial, geometric, Poisson, normal and sampling distributions; exploratory data analysis.

(8) PHY 103: GENERAL PHYSICS III (2 Units E: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. explain the concepts of heat and temperature and relate the temperature scales;
2. define, derive, and apply the fundamental thermodynamic relations to thermal systems;
3. describe and explain the first and second laws of thermodynamics, and the concept of entropy;
5. state the assumptions of the kinetic theory and apply techniques of describing macroscopic behaviour;
6. deduce the formalism of thermodynamics and apply it to simple systems in thermal equilibrium; and
7. describe and determine the effect of forces and deformation of materials and surfaces.

Course Contents

Heat and temperature (temperature scales). Gas laws. General gas equation. Thermal conductivity. First Law of thermodynamics (heat, work and internal energy, reversibility). Thermodynamic processes (adiabatic, isothermal, isobaric). Second law of thermodynamics (heat engines and entropy). Zero's law of thermodynamics. Kinetic theory of gases. Molecular collisions and mean free path. Elasticity (Hooke's law, Young's, shear and bulk moduli). Hydrostatics (Pressure, buoyancy, Archimedes' principles). Bernoulli's equation and incompressible fluid flow. Surface tension (adhesion, cohesion, viscosity, capillarity, drops and bubbles).

(9) CHM 101: GENERAL CHEMISTRY I (2 Units E: LH 30)

Learning Outcomes

At the end of this course, the students should be able to:

1. define atom, molecules, and chemical reactions;
2. discuss the modern electronic theory of atoms;
3. write electronic configurations of elements on the periodic table;

4. justify the trends of atomic radii, ionization energies, electronegativity of the elements based on their position in the periodic table;
5. identify and balance oxidation – reduction equation and solve redox titration problems;
6. illustrate shapes of simple molecules and hybridized orbitals;
7. identify the characteristics of acids, bases and salts, and solve problems based on their quantitative relationship;
8. apply the principles of equilibrium to aqueous systems using LeChatelier's principle to predict the effect of concentration, pressure, and temperature changes on equilibrium mixtures;
9. analyse and perform calculations with the thermodynamic functions, enthalpy, entropy and free energy; and
10. determine the rate of reactions and its dependence on concentration, time and temperature

Course Contents

Atoms, molecules, elements and compounds and chemical reactions. Modern electronic theory of atoms. Electronic configuration, periodicity and building up of the periodic table. Hybridization and shapes of simple molecules. Valence forces and structure of solids. Chemical equations and stoichiometry, chemical bonding and intermolecular forces and kinetic theory of matter. Elementary thermochemistry; rates of reaction, equilibrium and thermodynamics. Acids, bases and salts. Properties of gases. Redox reactions and introduction to electrochemistry. Radioactivity.

(10) DUI CST 105: MORALITY AND GRACIOUS LIVING (2 Units C: LH 30)

Learning outcomes

On completion of the course, students should be able to:

1. **Understand** the characteristics of various ways of life in the Catholic Church;
2. **Discuss** overview of the history of Christian Spirituality
3. **Establish** the relevance of the practice of virtue and exercise of moral principles in the contemporary world;

4. **Confront** intelligently the discourse of LGBTQ
5. **Strengthened** to live moral life.

Course Content
Nature of theology as a rational account and systematic reflection on the meaning and content of Christian revelation and faith; instruments at the disposal of spiritual theology – word of God, sacraments and continuous struggle in the Christian life; various theological disciplines and their interconnectedness; meaning of spirituality; different aspects of spirituality - Biblical Studies, Liturgy, Pastoral theology. Systematic theology, Mystical theology, Church history, Ethics and Virtues and African theology - ; rise and development of monasticism and modern Spirituality; Vatican 11 Spirituality; overview of the history of Christian Spirituality; Christian virtues and ethic, universal application of charity, religious life and spiritual retreats.

100 LEVEL SECOND SEMESTER

(1) GST 112: NIGERIAN PEOPLE AND CULTURE (2 Units C: LH 30)

Learning Outcomes
At the end of the course, students should be able to:
1. analyse the historical foundation of the Nigerian culture and arts in pre-colonial times;
2. list and identify the major linguistic groups in Nigeria;
3. explain the gradual evolution of Nigeria as a political unit;
4. analyse the concepts of Trade, Economic and Self-reliance status of the Nigerian peoples towards national development;
5. enumerate the challenges of the Nigerian State towards Nation building;
6. analyse the role of the Judiciary in upholding people's fundamental rights;
7. identify acceptable norms and values of the major ethnic groups in Nigeria;

8. list and suggest possible solutions to identifiable Nigerian environmental, moral and value problems.

Course Contents

Nigerian history, culture and art up to 1800 (Yoruba, Hausa and Igbo peoples and culture; peoples and culture of the ethnic minority groups). Nigeria under colonial rule (advent of colonial rule in Nigeria; Colonial administration of Nigeria). Evolution of Nigeria as a political unit (amalgamation of Nigeria in 1914; formation of political parties in Nigeria; Nationalist movement and struggle for independence). Nigeria and challenges of nation-building (military intervention in Nigerian politics; Nigerian Civil War). Concept of trade and economics of self-reliance (indigenous trade and market system; indigenous apprenticeship system among Nigeria people; trade, skill acquisition and self-reliance). Social justice and national development (law definition and classification). Judiciary and fundamental rights. Individual, norms and values (basic Nigeria norms and values, patterns of citizenship acquisition; citizenship and civic responsibilities; indigenous languages, usage and development; negative attitudes and conducts. Cultism, kidnapping and other related social vices). Re-orientation, moral and national values (The 3R's – Reconstruction, Rehabilitation and Re-orientation) Reorientation Strategies: Operation Feed the Nation (OFN), Green Revolution, Austerity Measures, War Against Indiscipline (WAI), War Against Indiscipline and Corruption (WAIC), Mass Mobilisation for Self-Reliance, Social Justice and Economic Recovery (MAMSER), National Orientation Agency (NOA). Current socio-political and cultural developments in Nigeria.

(2) COS 102: PROBLEM SOLVING (2 Units C: LH 30; PH 0)

Learning Outcomes

At the end of this course, students should be able to:

1. explain problem solving processes;
2. demonstrate problem solving skills;
3. describe the concept of algorithms development and properties of algorithms;

4. discuss the solution techniques of solving problem;
5. solve computer problems using algorithms, flowcharts, pseudocode; etc.; and
6. solve problems using programming language using C, PYTHON, etc.

Course Contents

Introduction to the core concepts of computing. Problems and problem-solving. The identification of problems and types of problems (routine problems and non-routine problems). Method of solving computing problems (introduction to algorithms and heuristics). Solvable and unsolvable problems. Solution techniques of solving problems (abstraction, analogy, brainstorming, trial and error, hypothesis testing, reduction, literal thinking, meansend analysis, method of focal object, morphological analysis, research, root cause analysis, proof, divide and conquer). General Problem-solving process. Solution formulation and design: flowchart, pseudocode, decision table, decision tree. Implementation, evaluation and refinement. Programming in C, Python etc.

Lab Work: Use of simple tools for algorithms and flowcharts; writing pseudocode; writing assignment statements, input-output statements and condition statements; demonstrating simple programs using any programming language (Visual Basic, Python, C)

(3) PHY 102: GENERAL PHYSICS II (Electricity & magnetism) (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. describe the electric field and potential, and related concepts, for stationary charges;
2. calculate electrostatic properties of simple charge distributions using Coulomb's law, Gauss's law, and electric potential;
3. describe and determine the magnetic field for steady and moving charges;
4. determine the magnetic properties of simple current distributions using Biot-Savart and Ampere's law;

5. describe electromagnetic induction and related concepts and make calculations using Faraday and Lenz's laws;
6. explain the basic physical of Maxwell's equations in integral form;
7. evaluate DC circuits to determine the electrical parameters;
9. determine the characteristics of ac voltages and currents in resistors, capacitors, and Inductors.

Course Contents

Forces in nature. Electrostatics (electric charge and its properties, methods of charging). Coulomb's law and superposition. Electric field and potential. Gauss's law. Capacitance. Electric dipoles. Energy in electric fields. Conductors and insulators. DC circuits (current, voltage and resistance. Ohm's law. Resistor combinations. Analysis of DC circuits. Magnetic fields. Lorentz force. Biot-Savart and Ampère's laws. Magnetic dipoles. Dielectrics. Energy in magnetic fields. Electromotive force. Electromagnetic induction. Self and mutual inductances. Faraday and Lenz's laws. Step up and step down transformers. Maxwell's equations. Electromagnetic oscillations and waves. AC voltages and currents applied to inductors, capacitors, and resistance.

(4) PHY 108 – GENERAL PRACTICAL PHYSICS II (1 Unit C: PH 45)

Learning Outcomes

On completion, the student should be able to:

1. conduct measurements of some physical quantities;
2. make observations of events, collect and tabulate data;
3. identify and evaluate some common experimental errors;
4. plot and analyse graphs;
5. draw conclusions from numerical and graphical analysis of data; and
6. prepare and present practical reports.

Course Contents

This practical course is a continuation of PHY 107 and is intended to be taught during the second semester of the 100 level to cover the

practical aspect of the theoretical courses that have been covered with emphasis on quantitative measurements, the treatment of measurement errors, and graphical analysis. However, emphasis should be placed on the basic physical techniques for observation, measurements, data collection, analysis and deduction.

(5) STA 121: STATISTICAL INFERENCE I (3 Units R: LH 45)
Learning Outcome
At the end of the course, students should be able to:

1. differentiate population from sample as well as point from interval estimate;
2. test for hypothesis concerning population mean and proportions for large and small samples;
3. compute regression and obtain the fitted line. Likewise, the computation for correlation coefficient well understood;
4. describe the fundamentals of time series analysis.

Course Contents
Population and samples. Random sampling distributions. Estimation (point and interval) and tests of hypotheses concerning population mean and proportion (one and two large sample cases). Regression and correlation. Elementary time series analysis.

(6) STA 112: PROBABILITY 1 (3 Units R: LH 45)
Learning Outcomes
At the end of the course, students should be able to:
1. explain the differences between permutation and combination;
2. explain the concept of random variables and relate it to probability and distribution functions;
3. describe the basic distribution functions; and
4. explain the concept exploratory data analysis.

Course Contents
Permutation and combination. Concepts and principles of probability. Random variables. Probability and distribution

functions. Basic distributions: Binomial, geometric, Poisson, normal and sampling distributions; exploratory data analysis.

(7) MTH 103: ELEMENTARY MATHEMATICS III (Vectors, Geometry and Dynamics) (2 Units R: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. solve some vectors in addition and multiplication;
2. calculate force and momentum; and
3. solve differentiation and integration of vectors.

Course Contents

Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar, multiplication of vectors, linear independence. Scalar and vector products of two vectors. Differentiation and integration of vectors with respect to a scalar variable. Two-dimensional coordinate geometry. Straight lines, circles, parabola, ellipse, hyperbola. Tangents, normals. Kinematics of a particle. Components of velocity and acceleration of a particle moving in a plane. Force, momentum, laws of motion under gravity, projectiles and resisted vertical motion. Elastic string and simple pendulum. Impulse, impact of two smooth spheres and a sphere on a smooth surface.

(8) CHM 102: GENERAL CHEMISTRY II (2 Units E: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. state the importance and development of organic chemistry;
2. define fullerenes and its applications;
3. discuss electronic theory;
4. determine the qualitative and quantitative of structures in organic chemistry;
5. describe rules guiding nomenclature and functional group classes of organic chemistry;
6. determine rate of reaction to predict mechanisms of reaction;

7. identify classes of organic functional group with brief description of their chemistry;
8. discuss comparative chemistry of group 1A, IIA and IVA elements; and
9. describe basic properties of transition metals.

Course Contents

Historical survey of the development and importance of organic chemistry, fullerenes as fourth allotrope of carbon, uses as nanotubules, nanostructures and nano chemistry. Electronic theory in organic chemistry. Isolation and purification of organic compounds. Determination of structures of organic compounds including qualitative and quantitative analysis in organic chemistry. Nomenclature and functional group classes of organic compounds. Introductory reaction mechanism and kinetics. Stereochemistry. The chemistry of alkanes, alkenes, alkynes, alcohols, ethers, amines, alkyl halides, nitriles, aldehydes, ketones, carboxylic acids and derivatives. The Chemistry of selected metals and non-metals. Comparative chemistry of group IA, IIA and IVA elements. Introduction to transition metal chemistry.

(9) DUI CST 107: CATHOLIC CHURCH AND THE SOCIEITY (2 Units C: LH 30)

Learning outcomes

On completion of the course, students should be able to:

1. **discuss** many of the issues pertinent to the concern of the church and society
2. **understand better** the working of the Catholic Church in society**;**
3. **live and witness** to the content and challenges of the social teaching of the Church
2. **explain** main concepts of expression in the language the Church uses in its discourse on issues of church and society

Course Content

Human dignity; integrity of creation; the common good in society; the role of government in the state; civil society; nongovernmental

organizations; Human rights and Responsibilities; Economy Justice; Global Solidarity; Preferential option for the Poor and Venerable; Participation in the life of the Society; Promotion of Peace and Justice; Critique of the social ministry of the church in society.

200 LEVEL (FIRST SEMESTER)

(1) ENT 211: ENTREPRENEURSHIP AND INNOVATION (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. explain the concepts and theories of entrepreneurship, intrapreneurship, opportunity seeking, new value creation, and risk taking;
2. state the characteristics of an entrepreneur;
3. analyse the importance of micro and small businesses in wealth creation, employment, and financial independence;
4. engage in entrepreneurial thinking;
5. identify key elements in innovation;
6. describe stages in enterprise formation, partnership and networking including business planning;
7. describe contemporary entrepreneurial issues in Nigeria, Africa and the rest of the world; and
8. state the basic principles of e-commerce.

Course Contents

Concept of Entrepreneurship (Entrepreneurship, Intrapreneurship / Corporate Entrepreneurship). Theories, Rationale and relevance of Entrepreneurship (Schumpeterian and other perspectives, risk-taking, necessity and opportunity-based entrepreneurship and creative destruction). Characteristics of Entrepreneurs (Opportunity seeker, risk taker, natural and nurtured, problem solver and change agent, innovator and creative thinker). Entrepreneurial thinking (Critical thinking, Reflective thinking, and Creative thinking). Innovation (Concept of innovation, Dimensions of innovation, Change and innovation, Knowledge and innovation). Enterprise

formation, partnership and networking (Basics of business plan, Forms of business ownership, business registration and forming alliances and joint ventures). Contemporary Entrepreneurship Issues (knowledge, skills and technology, intellectual property, virtual office, networking). Entrepreneurship in Nigeria (Biography of inspirational entrepreneurs, youth and women entrepreneurship, Entrepreneurship support institutions, Youth enterprise networks and environmental and cultural barriers to entrepreneurship). Basic principles of e-commerce.

(2) COS 201: COMPUTER PROGRAMMING I (3 Units C1: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. identify different programming paradigms and their approaches to programming;
2. write programmes using basic data types and strings;
3. design and implement programming problems using selection;
4. design and implement programming problems using loops;
5. use and implement classes as data abstractions in an object-oriented approach;
6. implement simple exception handling in programmes;
7. develop programmes with input/output from text files; and
8. design and implement programming problems involving arrays.

Course Contents

Introduction to computer programming. Functional programming; Declarative programming; Logic programming; Scripting languages. Introduction to object-orientation as a technique for modelling computation. Introduction of a typical object-oriented language, such as Java. Basic data types, variables, expressions, assignment statements and operators. Basic objectoriented concepts: abstraction; objects; classes; methods; parameter passing; encapsulation. Introduction to Strings and string processing; Simple I/O; control structures; Arrays; Simple recursive algorithms; inheritance; polymorphism.

Lab work: Programming assignments involving hands-on practice in the design and implementation of simple algorithms such as finding the average, standard deviation, searching and sorting. Practice in developing and tracing simple recursive algorithms. Developing programmes involving inheritance and polymorphism.

(3) CSC 203: DISCRETE STRUCTURES (2 Units C: LH 30)

Learning Outcomes

At the end of this course, the students will be able to:

1. convert logical statements from informal language to propositional and predicate logic expressions;
2. describe the strengths and limitations of propositional and predicate logic;
3. outline the basic structure of each proof technique (direct proof, proof by contradiction, and induction) described in this unit;
4. apply each of the proof techniques (direct proof, proof by contradiction, and induction) correctly in the construction of a sound argument;
5. apply the pigeonhole principle in the context of a formal proof;
6. compute permutations and combinations of a set, and interpret the meaning in the context of the particular application;
7. map real-world applications to appropriate counting formalisms, such as determining the number of ways to arrange people around a table, subject to constraints on the seating arrangement, or the number of ways to determine certain hands in cards (e.g., a fullhouse); and
8. solve a variety of basic recurrence relations.

Course Contents

Propositional Logic. Predicate Logic. Sets. Functions. Sequences and Summation. Proof Techniques. Mathematical induction. Inclusion-exclusion and Pigeonhole principles. Permutations and Combinations (with and without repetitions). The Binomial Theorem. Discrete Probability. Recurrence Relations.

(4) IFT 211: DIGITAL LOGIC DESIGN (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students will be able to:

1. explain why everything is data, including instructions, in computers;
2. describe how negative integers, fixed-length numbers, and non-numeric data are represented;
3. convert numerical data from one format to another;
4. describe computations as a system characterised by a known set of configurations with transitions from one unique configuration (state) to another (state);
5. describe the distinction between systems whose output is only a function of their input (combinational) and those with memory/history (sequential);
6. describe a computer as a state machine that interprets machine instructions;
7. articulate that there are many equivalent representations of computer functionality, including logical expressions and gates, and be able to use mathematical expressions to describe the functions of simple combinational and sequential circuits; and
8. design the basic building blocks of a computer: arithmetic-logic unit (gate-level), registers (gate-level), central processing unit (register transfer-level), and memory (register transfer-level).

Course Contents

Introduction to information representation and number systems. Boolean algebra and switching theory. Manipulation and minimisation of completely and incompletely specified Boolean functions. Physical properties of gates: fan-in, fan-out, propagation delay, timing diagrams and tri-state drivers. Combinational circuits design using multiplexers, decoders, comparators and adders. Sequential circuit analysis and design, basic flip-flops, clocking and timing diagrams. Registers, counters, RAMs, ROMs, PLAs, PLDs, and FPGAs.

Lab Work: Simple combinational gates (AND, OR, NOT, NAND, NOR); Combinational circuits design using multiplexers, decoders,

comparators and adders. Sequential circuit analysis and design using basic flip-flops (S-R, J-K, D, T flip-flops); Demonstration of registers, counters, RAMs, ROMs, PLAs, PLDs, and FPGAs.

(5) SEN 201: INTRODUCTION TO SOFTWARE ENGINEERING (2 units R: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. describe the concept of the software life cycle;
2. explain the phases of requirements analysis, design, development, testing and maintenance in a typical software life cycle;
3. differentiate amongst the various software development models;
4. utilise UML for object-oriented analysis and design;
5. describe different design architectures;
6. explain the various tasks involved in software project management; and
7. describe the basic legal issues related to Software Engineering.

Course Contents

Software Engineering concepts and principles. Design, development and testing of software systems. Software processes: software lifecycle and process models. Process assessment models. Software process metrics. Life cycle of software system. Software requirements and specifications. Software design. Software architecture. Software metrics. Software quality and testing. Software architecture. Software validation. Software evolution: software maintenance; characteristics of maintainable software; re-engineering; legacy systems; software reuse. Software Engineering and its place as a computing discipline. Software project management: team management; project scheduling; software measurement and estimation techniques; risk analysis; software quality assurance; software configuration management. Software Engineering and law.

(6) MTH 201: MATHEMATICAL METHOD I (2 Units C: LH 30)

Learning Outcomes

At the end of the course students should be able to:

1. describe Real-valued functions of a real variable;
2. solve some problems using Mean value Theorem and Taylor Series expansion; and
3. evaluate Line Integral, Surface Integral and Volume Integrals.

Course Contents

Real-valued functions of a real variable. Review of differentiation and integration and their applications. Mean value theorem. Taylor series. Real-valued functions of two and three variables. Partial derivatives chain rule, extrema, Lagrangian multipliers. Increments, differentials and linear approximations. Evaluation of line, integrals. Multiple integrals.

(7) CYB 201: INTRODUCTION TO CYBERSECURITY AND STRATEGY (2 Units R: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. explain cybersecurity concepts, its methods, elements, and terminologies of cybersecurity -cyber, security, threat, attack, defence, and operations;
2. describe common cyber-attacks and threats, cybersecurity issues, challenges and proffered solutions, and build an enhanced view of main actors of cyberspace and cyber operations;
3. apply the techniques for identifying, detecting, and defending against cybersecurity threats, attacks and protecting information assets;
4. explain the impact of cybersecurity on civil and military institutions, privacy, business and government applications;
5. identify the methods and motives of cybersecurity incident perpetrators, and the countermeasures employed by organisations and agencies to prevent and detect those incidences and software application vulnerabilities; and

6. state the ethical obligations of security professionals, evaluate cybersecurity and national security strategies to the typologies of cyber-attacks that require policy tools and domestic response, and define the cybersecurity requirements and strategies evolving in the face of big risk.

Course Contents

Basic concepts: cyber, security, confidentiality, integrity, availability, authentication, access control, non-repudiation and fault-tolerant methodologies for implementing security. Security policies, best current practices, testing security, and incident response, Risk management, disaster recovery and access control. Basic cryptography and software application vulnerabilities. Evolution of cyber-attacks. Operating system protection mechanisms, intrusion detection systems, basic formal models of security, cryptography, steganography, network and distributed system security, denial of service (and other) attack strategies, worms, viruses, transfer of funds/value across networks, electronic voting, secure applications. Cybersecurity policy and guidelines. Government regulation of information technology. Main actors of cyberspace and cyber operations. Impact of cybersecurity on civil and military institutions, privacy, business and government applications; examination of the dimensions of networks, protocols, operating systems, and associated applications. Methods and motives of cybersecurity incident perpetrators, and the countermeasures employed by organisations and agencies to prevent and detect those incidences. Ethical obligations of security professionals. Trends and development in cybersecurity. Software application vulnerabilities. Evolution of cybersecurity and national security strategies, requirements to the typologies of cyber-attacks that require policy tools and domestic response. Cybersecurity strategies evolving in the face of big risk. Role of standards and frameworks.

(8) MTH 209: INTRODUCTION TO NUMERICAL ANALYSIS (2 Units E: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. solve some numerical solution of algebraic and transcendental equations;
2. describe curve fitting;
3. discuss error analysis;
4. calculate interpolation and approximation;
5. solve some numerical differentiation and numerical integration problems; and
6. solve some numerical problems in ordinary Differential equations with initial value problems;

Course Contents

Solution of algebraic and transcendental equations. Curve fitting. Error analysis. Interpolation and approximation. Zeros of non-linear equations 'in one variable'. Systems of linear equations. Numerical differentiation and integration. Initial value problems in ordinary differential equation.

(9) IFT 203: INTRODUCTION TO WEB TECHNOLOGIES (2 Units C: LH 15, PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. state the origin of the Internet and the World Wide Web;
2. create simple web content using HTML, CSS, and JavaScript;
3. use simple application frameworks to develop web content
4. appraise the impact of the World Wide Web on people's lives over time.

Course Contents

Introduction to the Internet, the World Wide Web (WWW), and web development. WWW as a platform for interactive applications, content publishing, and social services. The role of HTTP and HTTPS in the context of web applications. Roles and operations of web browsers and the webserver. Interacting with web applications

through forms, and using style sheets to separate document structure and document formatting. Web development tools and frameworks. Build a simple website that organises information effectively, uses valid HTML and CSS, and applies appropriate web standards from standards bodies such as W3C. HTTP communication protocol, the mark-up 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. Impact of the World Wide Web on people's lives over time.

Lab Work: Using simple form-based web applications; developing simple websites using web development tools and frameworks; using the mark-up languages HTML, XHTML and XML; using JavaScript.

(10) DUI-CMP 202: VISUAL PRESENTATIONS FOR EFFECTIVE COMMUNICATION (2 Units C: LH 15; PH 45)

Learning outcomes

On completion of the course, the student should be able to:

1. **Describe** the dos and don'ts of effective visual presentations.
2. **Create** engaging and passionate presentations like those done in TEDx;
3. **Use** powerful visual aids to elaborate their presentations;
4. **Use** data visualizations for communicating findings and opinion polls;
5. **Create** and use slides, whiteboards, academic posters, handouts, etc.
6. **Create** and format Microsoft PowerPoint Slides and use Presenter Notes in PowerPoint; and
7. **Demonstrate** how to record a PowerPoint presentation with a screen capture.

Course contents

Effective visual presentation. Creating engaging and passionate presentations to convince and sell ideas. Powerful visual aids and how to use them. Simplicity, elegance and consistency as essential

ingredients. Some applications to use for effective visual presentations. Some types of visual presentations and how to use them effectively: slides, charts, whiteboards, videos, infographics, academic posters and paper handouts. Slide layouts, presenter view, slides, master slide. Choosing a theme (choosing preloaded Microsoft themes). Formatting slides (using different colours and fonts, changing slide background). Working with slides (adding and deleting, rearranging slides and sections). Visual boosts (insert picture/clipart/ images/diagrams/ charts and adding transitions, adding animation and inserting videos and hyperlinks). Making notes under slides and saving. Review and deliver presentation (previewing and printing handouts). Delivering a presentation. Presenting a difficult and complicated idea to convince people to buy into it, using only Microsoft PowerPoint.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. For example, those in accounting can be taught how to effectively use PowerPoint to present an end-of-year accounting report, while those in Business Administration can be taught how to use it effectively in pitching a business, etc. The emphasis should be on practical application; the students should be taught how to do that, more than just the generic features of the application.

(11) DUI-CIE 201: INTRODUCTION TO CREATIVITY AND INNOVATION (2 Units; C; LH 30; PH 0)

Learning Outcomes

On completion of the course, students should be able to:

1. **Discuss** the nature of change.
2. **Explain** the meaning of creativity and innovation.
3. **Explain** the place of creativity and innovation in Computer Science.
4. **Describe** the creative and innovative process
5. **Discuss** some models/schools of thought of creativity and innovation.

Course Contents
The Change Discourse. Nature of Creativity. Nature of Innovation. Understanding the Creativity and Innovation Connection. Examining Creative Expressions within Computer Science. Models/ Schools of Creativity and Innovation. Brainstorming. The Creative Problem Solving Process. Divergent Thinking Techniques. Convergent Thinking Techniques. Brainwriting. Psychoticism. Mind Mapping. Psychology of Creativity. Story Boarding for Programme Development. Point for Evaluating Applications. Facilitating Problem Solving Processes in Computer Science.

200 LEVEL (SECOND SEMESTER)

(1) GST 212: PHILOSOPHY, LOGIC AND HUMAN EXISTENCE (2 Units C: LH 30)

Learning Outcomes
At the end of this course, students should be able to:
1. know the basic features of philosophy as an academic discipline;
2. identify the main branches of philosophy & the centrality of logic in philosophical discourse;
3. know the elementary rules of reasoning;
4. distinguish between valid and invalid arguments;
5. think critically and assess arguments in texts, conversations and day-to-day discussions;
6. critically asses the rationality or otherwise of human conduct under different existential conditions;
7. develop the capacity to extrapolate and deploy expertise in logic to other areas of knowledge, and
8. guide his or her actions, using the knowledge and expertise acquired in philosophy and logic.

Course Contents
Scope of philosophy; notions, meanings, branches and problems of philosophy. Logic as an indispensable tool of philosophy. Elements of syllogism, symbolic logic— the first nine rules of inference. Informal fallacies, laws of thought, nature of arguments. Valid and

invalid arguments, logic of form and logic of content — deduction, induction and inferences. Creative and critical thinking. Impact of philosophy on human existence. Philosophy and politics, philosophy and human conduct, philosophy and religion, philosophy and human values, philosophy and character molding, etc.

(2) COS 202: COMPUTER PRORAMMING II (OOP) (3 Units C: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. develop solutions for a range of problems using object-oriented programming;
2. use modules/packages/namespaces for programme organisation;
3. use API in writing applications;
4. apply divide and conquer strategy to searching and sorting problems using iterative and/or recursive solutions;
5. explain the concept of exceptions in programming and how to handle exceptions in programmes;
6. write simple multithreaded applications; and
7. design and implement simple GUI applications.

Course Contents

This course is a continuation of CSC201. Review and coverage of advanced object-oriented programming - polymorphism, abstract classes and interfaces. Class hierarchies and programme organisation using packages/namespaces. Use of API – use of iterators/enumerators, List, Stack, Queue from API; Searching; sorting; Recursive algorithms; Event-driven programming: event-handling methods; event propagation; exception handling. Applications in Graphical User Interface (GUI) programming.

Lab work: Programming assignments leading to extensive practice in problem-solving and programme development with emphasis on object-orientation. Solving basic problems using static and dynamic data structures. Solving various searching and sorting algorithms using iterative and recursive approaches. GUI programming.

(3) IFT 212: COMPUTER ARCHITECTURE AND ORGANISATION (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students will be able to:

1. explain the organisation of the classical von Neumann machine and its major functional units;
2. construct simple assembly language programme segments;
3. describe how fundamental high-level programming constructs are implemented at the machine-language level;
4. discuss the concept of control points and the generation of control signals using hardwired or microprogrammed implementations;
5. describe how the use of memory hierarchy (cache, virtual memory) is used to reduce the effective memory latency; and
6. explain the concept of interrupts and describe how they are used to implement I/O control and data transfers.

Course Contents

Principles of computer hardware and instruction set architecture. Internal CPU organisation and implementation. Instruction format and types, memory, and I/O instructions. Dataflow, arithmetic, and flow control instructions, addressing modes, stack operations, and interrupts. Data path and control unit design. RTL, microprogramming and hardwired control. The practice of assembly language programming. Memory hierarchy. Cache memory, Virtual memory. Cache performance. Compiler support for cache performance. I/O organisations. **Lab work:** Practical demonstration of the architecture of a typical computer. Illustration of different types of instructions and how they are executed. Simple Assembly Language programming. Demonstration of interrupts. Programming assignments to practice MS-DOS batch programming, Assembly Process, Debugging, Procedures, Keyboard input, Video Output, File and Disk I/O, and Data Structure. Demonstration of Reduced Instruction Set Computers. Illustration of parallel architectures and interconnection networks.

(4) MTH 202: ELEMENTARY DIFFERENTIAL EQUATIONS (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. define the following: order and degree of a differential equation;
2. describe some techniques for solving first and second order linear and non-linear equations; and
3. solve some problems related to geometry and physics.

Course Contents

Derivation of differential equations from primitive, geometry, physics, etc. order and degree of differential equation. Techniques for solving first and second order linear and non-linear equations. Solutions of systems of first order linear equations. Finite linear difference equations. Application to geometry and physics.

(5) CSC 299: SIWES I (3 Units C: PH 135)

Learning Outcomes

At the end of this training, students should be able to:

1. explain how a typical computer firm/unit operates;
2. describe the various assignments carried out and the skills acquired during the SIWES period; and
3. submit a comprehensive report on the knowledge acquired and the experience gained during the exercise.

Course Contents

Students are attached to private and public organisations for a period of three months during the second-year session long break with a view to making them acquire practical experience and to the extent possible, develop skills in all areas of Computer Science. Students are supervised during the training period and shall be expected to keep records designed for the purpose of monitoring their performance. They are also expected to submit a report on the experience gained and defend their reports.

(6) INS 202 HUMAN-COMPUTER INTERFACE (HCI) (2 Units R: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. discuss the foundations and concept of the human-computer interface;
2. explain Understanding of principles of human-computer interface;
3. explain the design and development of the human-computer interface; and
4. explain the importance of user feedback.

Course Contents

Foundations of HCI. The concept underlying the design of HCI. Principles of GUI. GUI toolkits. System design methods. User conceptual models and interface metaphors. Human cognitive and physical ergonomics. Human-centred software evaluation and development. GUI design and programming.

Lab Work: Illustration of the principles of HCI design. Practice on GUI design and programming. Demonstration of some GUI toolkits. Practical evaluation of GUIs.

(7) MTH 204: LINEAR ALGEBRA I (2 Units R: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. explain vector space;
2. describe linear transformations and their representation by matrices; and
3. calculate algebra of various matrices.

Course Contents

Vector space over the real field. Sub-spaces, linear independence, basis and dimension. Linear transformations and their representation by matrices – rings, null space, rank. Singular and nonsingular transformation and matrices. Algebra of matrices.

(8) STA 204: STATISTICAL COMPUTING, INFERENCE AND MODELLING (R Units C: LH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. make conclusions based on statistical assumptions, models and results;
2. make inference on statistical outcomes, and real-world implications and how these outcomes are factored into decision-making processes;
3. demonstrate the various considerations that are applied both for communicating statistical solutions to real problems;
4. make conclusions based on statistical models and results by applying a broad range of statistical tools and packages; and
5. demonstrate logical, meaningful skills that bothers not just on the relevance of the data that informed the statistical outcomes, but also on the real-world implications of how these outcomes are factored into decision-making processes.

Course Contents

Population and samples. Asymptotics. Statistical models and methodologies. Random sampling distributions. Elementary time series analysis. Index numbers. Demographic measures. Estimation (point and interval) and tests of hypotheses concerning population mean and proportion (one and two sample cases). Regression and correlation. Programming in Python computer language. Computation of mean, variance and correlation. Sorting and ranking of data. Data Step Processing. Preparing Data for Analysis. Evaluating Quantitative Data. Sample Size Estimation. Basic statistical computing in regression analysis and the analysis of designed experiments. Introduction to Monte Carlo methods. Use of statistical packages like SPSS, SAS, Minitab, GENSTAT, EPI-INFO, SYSTAT.

Lab work: Practical experiments on statistical models and methodologies. Practical exercises on random sampling distribution methods. Practicals on test of hypothesis, population, mean, proportion, regression and correlation analysis. Exercise on how to

sort and data from different data set. Use of SPSS for data analysis and computation.

(9) PHY 202: ELECTRIC CIRCUITS AND ELECTRONICS (2 units C; LH 30)

Learning Outcomes

At the end of the course, the student should be able to:

1. explain electric circuit and electronics;
2. mention all entire the different circuit theorem;
3. apply the concept to solve simple problems;
4. differentiate between N-type and P-type semiconductor;
5. solve basic A.C problems; and
6. design simple circuit.

Course Contents

D.C. Circuits. Kirxhoff's Laws. Sources of e.m.f and current. Network analysis and circuit theorems. A.C. Circuits. Inductance, capacitance, and the transformer. Sinusoidal wave-forms, r.m.s and peak values. Power, impedance and admittance series. RLC circuit, Q factor, and resonance. Network analysis and circuit theorems. Filters. Electronics, semiconductors, the pnjunction, field effect transistors, bipolar transistors, characteristics and equivalent circuits, amplifiers, feedback, oscillators.

(10) DUI-CMP 204: BASIC USE OF COMPUTERS AND OFFICE APPLICATIONS (2 Units C: LH 15; PH 45)

Learning outcomes

On completion of the course, the student should be able to:

1. **Define** basic computer terms, such as computer, user, hardware, software, internet, etc., and identify the various computer types.
2. **Identify** the various types of hardware and software and explain their purpose.
3. **Describe** computer networks and their related connection devices.

4. **Explore** the desktop, update system files, manage user accounts, display windows, and manage folders and files in Windows OS
5. **Perform** basic computer troubleshooting and system maintenance
6. **Create,** edit and proofread a Microsoft Word document using track changes.
7. **Use** and modify Microsoft Excel workbooks and worksheets and create simple diagrams on Microsoft Visio.

Course contents

Introduction to information and communication technology. Types of computers. Computer hardware and software. Computer networks: types of networks; connection devices (Wi-Fi Routers, Modems, LAN Cables). Exploring Windows OS. Viruses, unlawful access, and system failure; secure passwords and password recovery; enhancing computer security and privacy. Basic troubleshooting techniques and system maintenance. Exploring Word: formatting text, finding and replacing text, correcting errors; organising information in columns and tables; adding page numbers, header and footer; adding pictures and changing a document background. Working with references: creating and modifying auto-generated table of contents; inserting and modifying citations and changing from one referencing style to another, inserting and modifying tables of figures, captions and cross-referencing. Some intermediate tasks with Word: inserting and modifying Index; working with section breaks. Producing a simple and aesthetic newsletter for a think-tank group using only Microsoft Word. Exploring Excel: creating and modifying workbooks and worksheets. Working with data: basic calculations and formulas. Creating and editing charts and mail merge. Producing a simple account-reporting template for a think-tank group using only Microsoft Excel. Using Microsoft Visio for creating various diagrams and visual aids, such as organograms, pyramids, flowcharts, etc. Producing a simple and efficient organogram of a think-tank group using only Microsoft Visio.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. For example, in teaching Excel, emphasis can be made on some formulas that the Accounting Department can use for their work, etc.

300 LEVEL (FIRST SEMESTER)

(1) GST 312: PEACE AND CONFLICT RESOLUTION (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. analyse the concepts of peace, conflict and security;
2. list major forms, types and root causes of conflict and violence;
3. differentiate between conflict and terrorism;
4. enumerate security and peacebuilding strategies; and
5. describe roles of international organisations, media and traditional institutions in peacebuilding.

Course Contents

Concepts of Peace, Conflict and Security in a multi-ethnic nation. Types and Theories of Conflicts: Ethnic, Religious, Economic, Geopolitical Conflicts; Structural Conflict Theory, Realist Theory of Conflict, Frustration-Aggression Conflict Theory. Root causes of Conflict and Violence in Africa: Indigene and Settlers Phenomenon; Boundaries/border disputes; Political disputes; Ethnic disputes and rivalries; Economic Inequalities; Social disputes; Nationalist Movements and Agitations; Selected Conflict Case Studies – Tiv-Junkun; Zango Kartaf, Chieftaincy and Land disputes, etc. Peace Building, Management of Conflicts and Security: Peace & Human Development. Approaches to Peace & Conflict Management (Religious, Government, Community Leaders, etc.). Elements of Peace Studies and Conflict Resolution: Conflict dynamics assessment Scales: Constructive & Destructive. Justice and Legal framework: Concepts of Social Justice; The Nigeria Legal System. Insurgency and Terrorism. Peace Mediation and Peace Keeping.

Peace & Security Council (International, National and Local levels) Agents of Conflict resolution – Conventions, Treaties Community Policing: Evolution and Imperatives. Alternative Dispute Resolution, ADR. Dialogue b). Arbitration, c). Negotiation d). Collaboration, etc. Roles of International Organisations in Conflict Resolution. (a). The United Nations, UN and its Conflict Resolution Organs. (b). The African Union & Peace Security Council (c). ECOWAS in Peace Keeping. Media and Traditional Institutions in Peace Building. Managing Post-Conflict Situations/Crisis: Refugees. Internally Displaced Persons, IDPs. The role of NGOs in Post-Conflict Situations/Crisis.

(2) CSC 301: DATA STRUCTURES (3 Units C: LH 30; PH 45)
Learning Outcomes
At the end of this course, students should be able to:
1. discuss the appropriate use of built-in data structures;
2. apply object-oriented concepts (inheritance, polymorphism, design patterns, etc.) in software design;
3. implement various data structures and their algorithms, and apply them in implementing simple applications;
4. choose the appropriate data structure for modelling a given problem;
5. analyse simple algorithms and determine their efficiency using big-O notation; and
6. apply the knowledge of data structures to other application domains like data compression and memory management.

Course Contents
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.
Lab work: Writing C+/C++ functions to perform practical exercises and implement using the algorithms on arrays, records, string processing, queues, trees, pointers and linked structures.

(3) CSC 309: ARTIFICIAL INTELLIGENCE (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. explain AI fundamentals, concepts, goals, types, techniques, branches, applications, AI technology and tools;
2. discuss intelligent agents, their performance, examples, faculties, environment and architectures, and determine the characteristics of a given problem that an intelligent system must solve;
3. describe the Turing test and the "Chinese Room" thought experiment, and differentiate between the concepts of optimal reasoning/behaviour and human-like reasoning/behaviour;
4. describe the role of heuristics and the trade-offs among completeness, optimality, time complexity, and space complexity;
5. analyse the types of search and their applications in AI and describe the problem of combinatorial explosion of search space and its consequences;
6. demonstrate knowledge representation, semantic network and frames along with their applicable uses;
7. practice Natural Language Processing, translate a natural language (e.g., English) sentence into a predicate logic statement, convert a logic statement into clause form, apply resolution to a set of logic statements to answer a query; and
8. analyse programming languages for AI and expert systems technology, and employ application domains of AI.

Course Contents

Overview of Artificial Intelligence. History of AI. Goals of AI. AI Technique. Types of AI. Branches and applications of AI. Advantages and Disadvantages. Introduction to Intelligent Agents. Agent Performance, Examples of Agents, Agent Faculties, Rationality, Agent Environment. Agent Architectures. Search. General Classes of AI Search Algorithm Problems. Problem Solving by Search. Types of AI Search Techniques and Strategies. Introduction to the types of problems and techniques in AI. Problem-Solving methods. Major structures used in AI programmes.

Knowledge Representation. KR and Reasoning Challenges. KR Languages. Knowledge representation techniques such as predicate logic, non-monotonic logic, and probabilistic reasoning. Semantic Network - types of relationships, semantic network inheritance, types and components. Introduction to Frames. Natural Language Processing (NLP). Introduction to natural language understanding and various syntactic and semantic structures. Introduction to Expert Systems - characteristics, components, types, requirements, technology, development. Programming Languages for AI. Introduction to computer image recognition.

Lab work: Group practical in (i) Turing test practical - Students can act out their own version of the Turing test (ii) Facial recognition practical to aid in teaching students how machine learning works with students simulating a facial recognition algorithm. Practical applications of NLP in groups – (i) Question Answering focuses on building systems that automatically answer the questions asked by humans in a natural language (ii) Spam detection application for detecting unwanted e-mails getting to a user's inbox (iii) Sentiment analysis/opinion mining should be used on the web to analyse the attitude, behaviour, and emotional state of the sender, implemented through a combination of NLP and statistics (iv) Practical exercise of machine translation used to translate text or speech from one natural language to another natural language such as the Google Translator (v) Developing a model to provide word processor software for the spelling correction (vi) Developing a model for speech recognition for converting spoken words into text (vii) Implementing a Chatbot to provide the staff/student's chat services.

OR

Group Practical exercise on agents and its environment using simulation of a colony of ants foraging for food; model simulating a message between agents; model simulating the flocking behaviour of birds; model to apply standard search algorithm to the classic search problem of missionaries and cannibals, and how to use communicating agents for searching networks. Some computer AI animation exercises for any branch of AI. Practical exercise on simple robots coupling and programming. Group project of building

a lawn robot for trimming grasses, or any simple design and implementation of robotics.

(4) ICT 305: DATA COMMUNICATION SYSTEMS AND NETWORK (3 Units C: LH 30; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. explain data transmission over layered networks;
2. list and explain common internet technologies and protocols; and
3. explain network operating system.

Course Contents

Types and sources of data. Simple communications network. Transmission definitions, one way transmission, half duplex transmission, transmission codes, transmission modes, parallel transmission, serial transmission, bit synchronisation, character synchronisation, synchronous transmission, asynchronous transmission, efficiency of transmission. Introduction to network protocol. Seven Layer ISO-OSI standard protocols and network architecture. Transport protocols, session services protocols, and other protocols. Institute of Electrical and Electronics Engineering 802 standards. Error control and Data Compression: Forward Error Control; error detection methods; parity checking; linear block codes, cyclic redundancy checking; feedback error control, data compression, Huffman coding and dynamic Huffman coding. Local Area Networks: medium access control techniques – Ethernet, token bus and token ring; fibre distributed data interface, metropolitan area network. Peer-to-peer, Client Server. ClientServer Requirements: GUI design standards, interface independence, platform independence, transaction processing, connectivity, reliability, backup, and recovery mechanisms. Features and benefits of major recovery mechanisms. Network OS: (e.g., Novell NetWare, UNIX/LINUX, OS/2 & Windows NT). INTERNET: Definition, architecture, services, internet addressing. Internet protocol, IPv4, IPv6.

Lab Work: Demonstration of simple communications networks. Illustration of applications at the various levels of the OSI model.

Demonstration of different types of Local Area Networks (LANs). Illustration of Metropolitan Area Networks. Illustration of Error Detection and Error Correction techniques. Demonstration of Network Operating Systems.

(5) INS 204: SYSTEM ANALYSIS AND DESIGN (3 Units C: LH 30, PH 45)

Learning outcomes

At the end of this course, students should be able to:

1. describe system requirements gathering techniques;
2. explain data modelling technique (entity relationship modelling);
3. explain process modelling technique (data flow diagram);
4. describe system architectural design;
5. describe process and database design; and
6. explain user interface design.

Course Contents

Structured approach to analysis and design of information systems for businesses. Software development life cycle. Structured top-down and bottom-up design. Dataflow diagramming. Entity relationship modelling. Computer aided software engineering. Input and output, prototyping design and validation. File and database design. Design of user interfaces. Comparison of structured and object-oriented design.

Lab work: Practical exercises on software development life cycle (SDLC) activities with different case studies. Use of different information systems case studies to apply the knowledge of structured top-down and bottom –up design, dataflow diagram and entity relationship models.

(6) DTS 201: INTRODUCTION TO DATA SCIENCE (3 Units R: LH 30; PH 45)

Learning Outcomes

At the end of the course, the students should be able to:

1. demonstrate the principles of working with data across distributions, sizes and ranges;
2. explain from first principles the operations that power data-driven utilities that have transformed the modern computing industry; and
3. demonstrate foundational technological processes that enable various data functions.

Course Contents

Fundamentals of Data Science. Methodology of extracting knowledge from big datasets as well as various tools and platforms for Data Science. What is Data and why is it important? Basic classification of Data (Structured, semi-structured and unstructured data), Scope of Data Science, Steps of Data Science Process: Data collection, Pre-processing, training, and testing. Rudiments of data visualisations; Distributions, Probability, and Simulations; Predictions and Models. Use cases in various domains such Image, Natural Language, Audio and Video. Basic introduction to knowledge extraction: Data mining, Business Intelligence & Knowledge management, Introduction to Big Data integration and intelligence, Introduction to Data Analytics, Introduction to programming.

Lab work: Practical experiments on data science process steps in simulated models. Practical application of the methods and tools used in data science for prediction models with some simulated exerises. Practical experiments on how to extract knowledge; how to mine valuable data from large set of data sets using data mining process and methods. Learn how to integrate business intelligence in big data along with some data analytics pratical exercises. Simple exercises on R programming to enhance the coding knowledge acquired during theory class.

(7) IFT 302: WEB APPLICATION DEVELOPMENT (2 Units C: LH 15, PH 45)

Learning Outcomes

At the end of the lecture, the students should be able to:

1. design and implement simple client-side and server-side web applications;
2. demonstrate hands-on skills in PHP and Python programming using open-source software;
3. compare and contrast web programming with general-purpose programming
4. develop a fully functioning website and deploy it on a web server.

Course Contents

Introduction to framework-based web development using a contemporary language like PHP and ASP.net. Principles of web pages (dynamic and static) and website design. The tool used in web development. Client-side and server-side languages. Creation of interactive, dynamic websites using a common web architecture and object-based database access. Design, implementation, and testing of web-based applications including related software, databases, interfaces, and digital media. Standard object models, and the use of server-side programmes for database and file access; testing, software quality assurance; and the process of publishing Web sites. Hands-on PHP and Python programme using open-source software (Apache, PHP, Python, JavaScript, and MySQL). Programming for web development includes control structures, objects, functions, and the use of composite data types. Deploying dynamic content using JavaScript. Designing and developing dynamic web pages and creating, validating, transforming, and formatting data using PHP.

Lab Work: Simple PHP programming. Design of simple web pages. Creation of dynamic websites. Design of client-side and server-side programmes. Demonstration of web-based applications with database access. Use of JavaScript to develop dynamic content. Use of Python to develop dynamic web pages.

(8) DUI-CMP 304: CYBER TOOLS AND AI PROFICIENCY (2 Units C: LH 15, PH 45)

Learning outcomes

On completion of the course, the student should be able to:

1. **Define** the Internet and related terms.
2. **Explain** how the Internet works and the nature of the World Wide Web.
3. **Utilise** browsers and search engines to find information on the surface and deep web.
4. **Demonstrate** how to use the URLs and address bar, navigation buttons, tabbed browsing, bookmarks and history, downloading and uploading, plugins, and clearing browser cache and cookies.
5. **Utilise** the various AI tools available today for productivity and efficiency.
6. **Demonstrate** how to evaluate web-based information for veracity and relevance critically.
7. **Utilise** various online collaborations in communication, documentation, file sharing, organisation, project management, etc.
8. **Demonstrate** how to synchronise online collaboration tools to the mobile environment to enable people to work on the go.

Course contents:

Defining the Internet and related terms. How the internet works and the nature of the World Wide Web. Browsers, Internet Explorer, search engines and finding information. URLs and address bar, navigation buttons, tabbed browsing, bookmarks and history. Downloading and uploading, saving and plug-ins. Internet safety: secure passwords, browser security, cookies & account tracking. Internet safety: avoiding spam & phishing, malware, & suspicious links. Web-based information: search (surface web and deep web), critical evaluation (authority, accuracy, objectivity, currency, coverage, and purpose), copyright, & protection. Emails: creating accounts, composing, sending, and receiving mail. Emails: uploading & downloading attachments, settings, calendars, files &

folders. Online collaboration: communication tools, documentation tools, file-sharing tools, organizational tools, project management tools, design tools, etc. Online collaboration: preparation for & setting up accounts. Online collaboration: calendars, meetings & learning environments. Mobile collaboration: using mobile devices & synchronisation. Cloud computing: key concepts; why use the cloud & what is Web App. The various LLM models and AI tools available today.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. For example, emphasis should be on using AI to facilitate and enhance productivity in various fields of discipline.

(9) DUI-CIE 308 Creativity and Innovation For Business Success in Computer Science (2 Units; C: LH=15; PH=45)

Learning outcomes

On completion of the course, students should be able to:

1. explain the role of creativity and innovation for business success
2. discuss the role of change in the pursuit of business success
3. describe stakeholders' role in ideation for business success
4. discuss the creativity, innovation and business connection in computer science
5. evaluate cases in the creativity and innovation business challenge

Course contents

Creativity and innovation for business success. Change and business realities. Intrinsic motivation for creativity and innovation in business. Facilitating ideation from clients. Employee training for creativity and innovation. Creativity, innovation and Computer. Facilitating creative economic growth through Computer Science. Theories of Creativity in Computer Science. Design Thinking for

technology. Idea generation (SCAMPER: Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, Reverse). Prototyping and Rapid Iteration. Creativity and AI. Computational Arts and Media. Human-Computer Interaction (HCI)

Minimum Academic Standards

Sticky Notes, Pipe Cleaners, Smart Board, Laptop, Legos, Projector, Makers, Textbooks, Manuals, Timer, Flip Charts.

(10) DUI-MSR 121: METHODOLOGY OF SCIENTIFIC RESEARCH WRITING (2 Units R: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. identify and define research gaps in computing
2. identify different methods of data collection and data analysis
3. prepare appropriate data visualization for reports
4. design and develop a research proposal and plan;
5. document research problem and methodology all the way to research report writing;
6. defend the written research report; and
7. familiarise themselves with ethical issues in the conduct of research.

Course Contents

Developing Research Proposal and Research Plan. Formulation of working hypothesis and Testing. Literature review. Procedure for reviewing related relevant studies and referencing cited works. Types of Reports. Technical Report Writing. Preparing various data visualization methods: charts, tables, etc. Layout and mechanics of writing a Research Paper. Standard Techniques for Research Documentation. Sampling Design. Different Types of Sample Designs. Steps in Sampling Design. Criteria of Selecting a Sampling Procedure. Methods of analysis. Processing and Analysis of Data Elements/Types of Analysis. Interpretation and Presentation of results. How to prepare References and Bibliography.

300 LEVEL (SECOND SEMESTER)

(1) ENT 312: VENTURE CREATION (2 Units C: LH 15; PH 45)

Learning Outcomes

At the end of this course, students, through case study and practical approaches, should be able to:

1. describe the key steps in venture creation;
2. spot opportunities in problems and in high potential sectors regardless of geographical location;
3. state how original products, ideas, and concepts are developed;
4. develop business concept for further incubation or pitching for funding;
5. identify key sources of entrepreneurial finance;
6. implement the requirements for establishing and managing micro and small enterprises;
7. conduct entrepreneurial marketing and e-commerce;
9. apply a wide variety of emerging technological solutions to entrepreneurship; and
10. appreciate why ventures fail due to lack of planning and poor implementation.

Course Contents

Opportunity Identification (Sources of business opportunities in Nigeria, Environmental scanning, Demand and supply gap/unmet needs/market gaps/market research, Unutilised resources, Social and climate conditions, and technology adoption gap). New business development (business planning, market research). Entrepreneurial finance (venture capital, equity finance, microfinance, personal savings, small business investment organisations, and business plan competition). Entrepreneurial marketing and e-commerce (Principles of marketing, customer acquisition & retention, B2B, C2C and B2C models of e-commerce, first mover advantage, e-commerce business models and successful e-commerce companies,). Small business management/family business: Leadership & Management, basic bookkeeping, nature of family business and family business growth model. Negotiation and business communication (Strategy and tactics of

negotiation/bargaining, traditional and modern business communication methods). Opportunity discovery demonstrations (business idea generation presentations, business idea contest, brainstorming sessions, idea pitching). Technological solutions (the concept of market/customer solution, customer solution, and emerging technologies, business applications of new technologies-Artificial Intelligence (AI), Virtual/Mixed Reality (VR), Internet of Things (IoT), Blockchain, Cloud Computing, renewable energy, etc. digital business and e-commerce strategies).

(2) CSC 308 OPERATING SYSTEM (3 Units C: LH 30; PH 45)
Learning Outcomes
At the end of this course, students should be able to:
1. recognise operating system types and structures;
2. describe OS support for processes and threads;
3. recognise CPU scheduling, synchronisation, and deadlock;
4. resolve OS issues related to synchronisation and failure for distributed systems;
5. explain OS support for virtual memory, disk scheduling, I/O, and file systems;
6. identify security and protection issues in computer systems; and
7. use C and Unix commands, examine behaviour and performance of Linux, and develop various system programmes under Linux to make use of OS concepts related to process synchronisation, shared memory, mailboxes, file systems, etc.

Course Contents
Fundamentals of operating systems design and implementation. History and evolution of operating systems. Types of operating systems. Operating system structures. Process management: processes, threads, CPU scheduling, process synchronisation. Memory management and virtual memory. File systems; I/O systems; Security and protection; Distributed systems; Case studies. **Lab work**: Practical hands-on engagement to facilitate understanding of the material taught in the course. All the process, memory, file and directory management issues will be demonstrated under the LINUX operating system. Also UNIX commands will be

briefly discussed. Alternatively, hands-on exposure may be through the use of operating systems developed for teaching, like TempOS, Nachos, Xinu or MiniOS. Another possibility is through programming exercises that implement and simulate algorithms taught. Simulation of CPU scheduling algorithms, producer-consumer problem, memory allocation algorithms, file organisation techniques, deadlock algorithms and disk scheduling algorithms.

(3) CSC 322: COMPUTER SCIENCE INNOVATION AND NEW TECHNOLOGIES (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. explain business models;
2. identify some entrepreneurial opportunities available in IT;
3. describe business plan and business startup process;
4. explain business feasibility and strategy;
5. explain marketing strategies; and
6. discuss business ethics and legal issues.

Course Contents

Fundamental concepts of innovation and business ideas in general. Product development. Business leadership. Digital marketing. Entrepreneurial opportunities in IT. Legal issues and Business ethics. New venture creation process. Business feasibility planning. Market research. Business strategy. Business models and Business plans. Technical presentations. Report on a successful entrepreneurial outfit.

(4) DTS 304: DATA MANAGEMENT I (3 Units C: LH 30; PH 45)

Learning Outcomes

At the end of the course the students should be able to:

1. describe the components of a database system and give examples of their use;
2. describe the differences between relational and semi-structured data models;

3. explain and demonstrate the concepts of entity integrity constraint and referential integrity constraint;
4. apply queries, query optimisations and functional dependencies in relational databases;
5. describe properties of normal forms and explain the impact of normalisation on the efficiency of database operations;
6. describe database security and integrity issues and their importance in database design; and
7. explain the concepts of concurrency control and recovery mechanisms in databases.

Course Contents
Information Management Concepts. Information storage & retrieval. Information management applications. Information capture and representation. Analysis and indexing - search, retrieval, information privacy. Integrity and security. Scalability, Efficiency and Effectiveness. Introduction to database systems. Components of database systems. DBMS functions. Database architecture and data independence. Database query language. Conceptual models. Relational data models. Semi-structured data models. Relational theory and languages. Database Design. Database security and integrity. Introduction to query processing and optimisation. Introduction to concurrency and recovery.

Lab work: Practical exercise on information representation, capture, storage and retrieval. Learn how to analyse data and index for easy searching and indexing. Practical on creating database files and models. How to create and use various database designs. How to query the created database. Methods of concurrency and recovery in database. Learn how to secure the database.

(5) CSC 399: SIWES II (3 Units C: PH 135)
Learning Outcomes
At the end of this training, students should be able to:
1. explain how a typical computer firm/unit operates;
2. describe the various assignments carried out and the skills acquired during the SIWES period; and

3. submit a comprehensive report on the knowledge acquired and the experience gained during the exercise.

Course Contents

Students are attached to private and public organisations for a period of three months during the second-year session long break with a view to making them acquire practical experience and to the extent possible, develop skills in all areas of Computer Science. Students are supervised during the training period and shall be expected to keep records designed for the purpose of monitoring their performance. They are also expected to submit a report on the experience gained and defend their reports.

(6) CYB 302: BIOMETRIC SECURITY (2 Units E: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. discuss biometric algorithms and data analysis along with digital image/signal processing;
2. apply automated biometric identification: hands-fingers, palms and hands; heads-face, voice and eyes and other biometrics;
3. develop methods of obtaining biometric data and matching basics;
4. practice biometric authentication, enrolment, matching performance, setting a threshold. biometric authentication, matching data, ground truth, calculating errors rates and graphs;
5. create storage of biometric data elements, quality, upgrades, data security and integrity;
6. analyse privacy issues, security strength, recognition rates and other aspects of biometrics, passwords and smart cards; and
7. explore applications of biometrics and future trends.

Course Contents

Introduction to biometrics and digital image processing. Matlab in biometric image/signal processing. Biometric algorithms and

systems with emphasis on face, fingerprint, eyes (iris), speech (voice). Automated biometric identification multimodal biometrics. Biometric data: raw data, template data, and data methods. Biometric matching basics: biometric authentication, enrolment, correct user, and incorrect user. Match threshold and matching performance. Setting a threshold. Biometric authentication: matching data, ground truth, calculating errors rates and graphs. Biometric data: Storage of biometric data elements, transactions, errors and quality upgrades. Data security and integrity. Privacy issues and other aspects of biometrics. Applications of biometrics and future trends. Challenging issues: security strength and recognition rates. Alternatives of passwords and smart cards.
Lab work: Practical exercise on biometric capture, image processing, matching threshold and performance. Learn the practical aspect of automated biometric identification of multimodal, authentication and calculation of error rates. Work on biometric algorithms, privacy and security of stored biometric data.

(7) IFT 304: WEB DEVELOPMENT USING CONTENT MANAGEMENT SYSTEM
(2 Units C: LH 15, PH 45)
Learning Outcomes
At the end of the course, students should be able to:

1. develop a basic knowledge of web technology;
2. acquire skills necessary to develop and manage websites;
3. analyse Web content management techniques;
4. appraise the role of dynamic sites as the future of web design
5. convert a static design into a dynamic CMS-powered site.

Course Contents
Web development techniques using content management systems (CMS) (e.g., Joomla, MS SharePoint 2013). Design and creation of websites using specialised CMS tools. Review and evaluation of CMS tools and technologies in terms of client requirements. Development of Web sites using front-end (client-side) and back-end (server-side). Use of a CMS to set up, deploy, and maintain

websites. Programming while considering issues of interface and user experience design, accessibility, and Web standards. Methods, languages, tools related to developing web-based content management systems. Development of plugins or extensions that integrate with existing systems to extend their functionality. Audit content for a website. Choose an appropriate CMS, and convert a static design into a dynamic CMS-powered site.

Lab Work: Basic features of Content Management Systems. Developing websites using CMS. Developing front-ends and back-ends. Using various tools in CMS. Developing plugins and extensions. Converting static designs to dynamic websites.

(8) DUI-CMP 302: SURVEY OF PROGRAMMING LANGUAGE (3 units **C: LH 30, PH 45)**

Learning outcomes

On completion of the course, the student should be able to:

1. **Demonstrate** understanding of the evolution of programming languages and relate how this history has led to the paradigms available today.
2. **Describe** the various programming paradigms.
3. **Identify** 5 different data types supported by selected programming languages
4. **Explain** the unique features of the various programming languages.
5. **Demonstrate** increased ability to learn new languages.
6. **Practise** coding with different programming languages.

Course Contents

History of programming languages. Brief survey of programming paradigms. Brief study of Procedural languages. Brief study of Object-oriented languages. Brief study of Functional languages. Brief study of Declarative – non-algorithmic languages. Brief study of Scripting languages. The effects of scale on programming methodology. Language Description: Syntactic Structure (Expression notations, abstract Syntax Tree, Lexical Syntax, Grammars for Expressions, Variants of Grammars). Language

Semantics (Informal semantics, Overview of formal semantics, Denotation semantics, Axiomatic semantics, Operational semantics). Declarations and types. The concept of types. Declaration models (binding, visibility, scope, and lifetime). Overview of type-checking. Garbage collection. Abstraction mechanisms. Procedures, function, and iterations as abstraction mechanisms. Parameterization mechanisms (reference vs. value).

(9) DUI-CMP 306: DESKTOP PUBLISHING AND GRAPHIC DESIGN (2 units C: LH 15, PH 45)

Learning Outcomes

On completion of the course, the student should be able to:

1. **Describe** the features of desktop publishing.
2. **Enter** and edit the text in a Microsoft Publisher template.
3. **Create** a booklet with adequately formatted text/style and page numbers.
4. **Demonstrate** how to save booklets in PDF.
5. **Demonstrate** how to print a booklet back-to-back.
6. **Publish** brochures, calendars, and invitation cards.
7. **Create** an intuitive and creative template and layout using CorelDRAW.

Course contents

Introduction to Desktop Publishing. Introduction to Microsoft Publisher and its templates formatting text, paragraphs, styles. Inserting images, page numbering and formatting. Saving projects in PDF, printing projects (back-to-back printing). Any other projects such as brochures, calendars, invitation card, greeting cards, business cards, award certificates, etc. Design a simple three-fold brochure for a think-tank group. Introduction to graphic design. Explain the various image formats in a computer environment (JPEG, PNG, GIF, WEBP, etc). Introduction to Adobe Photoshop. Edit an image: cropping, resizing, rotating and transformation. Cropping off backgrounds and blending images together. Create a simple logo for a think-tank group. Introduction to CorelDraw. Page setup and layout in CorelDraw. Using of shapes, joining shapes and embedding images inside shapes. Text alignment, arrangement and

fitting to paths. Create a newsletter for a think-tank group, using CorelDraw only.

Though most parts of the course are generic, an emphasis should be placed on applying the course to the various departments offering the course. The emphasis should be on using these applications to create documents peculiar to each department.

(10) DUI-CST 303: ETHICS IN CONTEMPORARY TIME (2 units C: LH 30)

Learning Outcomes

On completion of the course, students should be able to

1. **Explain** the nature of ethics and its relevance to Computer Science.
2. **Distinguish** between ethics of Computer Science and Professional ethics in Computer Science.
3. **State** the traits of moral principles.
4. **Describe** the domains of ethical assessment.
5. **Demonstrate** knowledge of important ethical systems.
6. **Construct** sound ethical arguments with regard to ethical issues that arise in the work of computer scientists.
7. **Integrate** virtues in character formation of computer scientists.

Course Contents

Introduction to ethics and its subdivisions. Analysis of why the computer scientist ought to be moral. Nature (traits) of moral principles. Domains of ethical assessment. Introduction to the ethics of computer science. Professional ethics in computer science. Freedom and moral responsibility. Notion of the common good. Moral relativism. Moral objectivism. Some ethical theories - deontologism consequentialism, virtue theory. Ethical issues in computer science (hacking, intellectual property, privacy, data collection, algorithmic bias) Ethics and ICT professionals. Artificial Intelligence and ethics. Robotics and ethics. Computer games and ethics. Virtual reality (virtual identity) and ethics.

400 LEVEL (FIRST SEMESTER)

(1) COS 409: RESEARCH METHODOLOGY AND TECHNICAL REPORT WRITING (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. distinguish qualitative and quantitative research methodologies and their applications;
2. identify and define a research problem in a given area;
3. identify different methods of data collection and select the methods appropriate to a given situation;
4. design and conduct simple research including analysis and interpretation of research results;
5. document research problem, methodology all the way to research report writing;
6. defend the written research report; and
7. familiarise themselves with ethical issues in the conduct of research.

Course Contents

Foundations of Research. Types of Research. Research Approaches. Significance of Research. Research Methods versus Methodology. Research Process. Criteria and Strategy for Good Research. Problems Encountered by Researchers in Nigeria. Principles of Scientific Research. Scientific investigation. Problem formulation. Definition and technique of the Research Problem. Selection of Appropriate Method for Data Collection- Primary Data and Secondary Data. Guidelines for Constructing Questionnaire/Schedule. Guidelines for Successful Interviewing. Difference between Survey and Experiment. Eloping Research Proposal and Research Plan. Formulation of working hypothesis and Testing. Literature review. Procedure for reviewing related relevant studies and referencing cited works. Types of Reports. Technical Report Writing. Layout and mechanics of writing a Research Report. Standard Techniques for Research Documentation. Sampling Design. Different Types of Sample Designs. Steps in

Sampling Design. Criteria of Selecting a Sampling Procedure. Methods of analysis. Processing and Analysis of Data Elements/Types of Analysis. Interpretation and Presentation of results. How to prepare References and Bibliography.

(2) CSC 401: ALGORITHMS AND COMPLEXITY ANALYSIS (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. explain the use of big-O, omega, and theta notation to describe the amount of work done by an algorithm,
2. use big-O, omega, and theta notation to give asymptotic upper, lower, and tight bounds on time and space complexity of algorithms,
3. determine the time and space complexity of simple algorithms,
4. deduce recurrence relations that describe the time complexity of recursively defined algorithms,
5. solve elementary recurrence relations,
6. for each of the strategies (brute-force, greedy, divide-and-conquer, recursive backtracking, and dynamic programming), identify a practical example to which it would apply,
7. use pattern matching to analyse substrings, and
8. use numerical approximation to solve mathematical problems, such as finding the roots of a polynomial.

Course Contents

Basic algorithmic analysis. Asymptotic analysis of Upper and average complexity bounds. Standard Complexity Classes. Time and space trade-offs in analysis recursive algorithms. Algorithmic Strategies. Fundamental computing algorithms. Numerical algorithms. Sequential and Binary search algorithms. Sorting algorithms, Binary Search trees. Hash tables. Graphs and their representation.

(3) INS 401: PROPJECT MANAGEMENT (2 Units C: LH 30)

Learning Outcomes

At the end of this course, students should be able to:

1. describe project management planning;
2. describe project scheduling;
3. explain management of project resources;
4. discuss project procurement, monitoring and execution; and
5. explain project communication and time management.

Course Contents

Introduction to Project Management. The Project Management Lifecycle: Project management and systems development or acquisition. The project management context. Technology and techniques to support the project management lifecycle, and Project management processes. Managing Project Teams: Project team planning, motivating team members, Leadership, power and conflict in project teams, and managing global project teams. Managing project communication and enhancing team communication. Project Initiation and Planning. Managing Project Scope: Project initiation, how organisations choose projects, Activities, and Developing the project charter. Managing Project Scheduling: Common problems in project scheduling, and Techniques for project scheduling. Managing Project Resources: Types of resources (human, capital, time), and Techniques for managing resources. Project quality and tools to manage project quality. Managing project risk and tools for managing project risk. Managing Project Procurement: Alternatives to systems development, External acquisition, Outsourcing-domestic and offshore. Steps in the procurement process, and managing the procurement process. Project Execution, Control and Closure: Managing project execution, monitoring progress and managing change. Documentation and communication, and Common problems in project execution. Managing Project Control and Closure: Obtaining information, Cost control, Change control, administrative closure, Personnel closure, Contractual closure and Project auditing.

(4) CSC 497: FINAL YEAR PROJECT I (3 Units C: PH 135)

Learning Outcomes

At the end of this course, students should be able to:

1. identify a researchable project topic in Computer Science;
2. search and review literature pertinent to identified problem statement;
3. acknowledge and reference sources of information used in the research report;
4. conceptualise and design a research methodology to address an identified problem;
5. determine tools for analysing data collected based on research objectives;
6. write a coherent proposal on the research project to be conducted;
7. orally present the written project proposal.

Course Contents

An independent or group investigation of appropriate software, hardware, communication and networks or IT related problems in Computer Science carried out under the supervision of a lecturer. Before registering, the student must submit a written proposal to the supervisor to review. The proposal should give a brief outline of the project, estimated schedule of completion, and computer resources needed. A formal written report is essential and an oral presentation may also be required.

(5) DTS 302: BIG DATA COMPUTING (2 Units R: LH 15; PH 45)

Learning Outcomes

At the end of the course the students should be able to:

1. identify Big Data;
2. identify some of the foundational tools, systems, and platforms that feature in working with Big Data across several domains;
3. install Big Data working tools on a computer; and
4. analyse Big Data contents.

Course Contents

Installation: Cloudera VM, Jupyter server. Big data retrieval and relational querying: Postgres databases, NoSQL data, MongoDB, Aerospike, and Pandas for data aggregation and working with data frames. Big Data Integration: Splunk and Datameer. Big Data Processing: Apache Spark, Hadoop, Spark Core (Spark MLlib and GraphX). Big Data Applications (Graph Processing). Big Data Streaming Platforms for Fast Data.

Lab Work: Analysing Twitter Data using Spark and MongoDB. Learn Big Data analytics skills. Practical procedure for the crafting of an enterprise-scale cost-efficient Big Data and machine learning solution to uncover insights and value from data. Use the practical exercises to bridge the gap between the theoretical world of technology with the practical ground reality of building corporate Big Data and data science platforms. Hands-on exposure to Hadoop and Spark (or any of the BD tools), build machine learning dashboards using R and R Shiny, create web-based apps using NoSQL databases. Practical assignment of BD security.

(6) IFT 403: MOBILE AND PERVASIVE COMPUTING (2 Units R: LH 15; PH 45)

Learning Outcomes

At the end of the course, students should be able to:

1. describe the concepts of programming mobile devices and pervasive computing;
2. define open protocols and context-aware sensor networks;
3. evaluate techniques, needs, and requirements for pervasive systems; and
4. describe security protocols for sensor networks.

Course Contents

Definitions and motivations: mobile, pervasive and ubiquitous computing. Physical interaction. Theoretical foundations of pervasive computing. Context-aware interaction, resource and device constraints. Implementing pervasive systems: sensor, actuators, and embedded systems. Applications, programming languages, and approaches, device types, and choices. Capturing

needs and requirements for pervasive systems: techniques and challenges. Multisensory communication using pervasive computing. Sensor Networks.Security Protocols for Sensor Networks. Introduction to cloud computing technologies and its services.

Lab Work: Developing simple mobile applications. Design of simple pervasive computer systems. Design of context-aware sensor networks. Testing the security of mobile and pervasive computer systems. Using security protocols for sensor networks.

(7) DUI-CST 407: APPLIED ETHICS IN PROFESSIONAL PRACTICE (2 Units C: LH 30)

Learning outcomes

On completion of the course, students should be able to:

1. **Define** applied ethics.
2. **Illustrate** the relevance of applied ethics to the professional practice of the computer scientist.
3. **Identify** ethical issues that arise in the professional practice of the computer scientist.
4. **Evaluate** the main arguments and positions on contemporary controversial moral issues in computer science.
5. **Distinguish** between moral issues and non-moral issues in professional practice.
6. **Construct** sound ethical arguments and views on relevant applied issues.
7. **Demonstrate** an ethical mindset conducive to professional practice of the computer scientist.

Course contents

Introduction to applied ethics. Review of ethical theories - virtue theory, deontologism, consequentialism. The computer scientist as a moral agent. Constructing moral arguments. Rights in applied ethics. Hacking. Intellectual property. Privacy. Data collection. Algorithmic bias. Artificial Intelligence. Robotics. Deep fakes. Disruptive technology. Virtual reality. Computer games. Autonomous things. Cybernetics

(8) DUI-CIE 401: ORGANISATIONAL MANAGEMENT OF CREATIVITY AND INNOVATION (2 Units C: LH 15; PH 45)

Learning Outcomes

On completion of the course, students should be able to:

1. **Explain** the meaning of management and leadership.
2. **Explain** the connection between management and leadership.
3. **Discuss** the challenges involved in Computer Science, creativity and innovation.
4. **Discuss** the issues involved in change, organisational creativity and innovation.
5. **Analyse** the different models/systems for managing creativity and innovation

Course Contents

Nature of Management. Nature of Leadership. Change. Change Management. The Creative, Innovator as a Change Manager/Agent. Communicating Change, Creativity and Innovation. Creativity Leadership for Change and Innovation. The FourSight Model of Managing the Innovation Process. Managing the Clarifiers. Managing the Ideators. Managing the Implementers. Managing the Developers. Biomimicry-Innovation from Nature. Lean Start-up Innovation Model. Issues in the Lean Start-up Innovation Model. Issues in Creativity, Innovation and Computer Science. Computer Science in the Management of Creativity and Innovation. Computer Science and Biomimicry.

400 LEVEL (SECOND SEMESTER)

(1) CSC 402: ETHICS AND LEGAL ISSUES IN COMPUTER SCIENCE (2 Units C: LH 30)

Learning Outcomes

At the end of the course, students should be able to:

1. state laws and regulations related to ethics;
2. identify and explain relevant codes of ethics for computing practice;
3. identify social and ethical issues in different areas of computing practice;
4. review real-life ethical cases and be able to develop ethical resolutions and policies;
5. explain the consequences of ignoring and non-compliance with ethical provisions; and
6. develop a sound methodology in resolving ethical conflicts and crisis.

Course Contents

Addresses social, ethical, legal and managerial issues in the application of Computer Science to the information technology industry. Through seminars and case studies, human issues confronting Computer Science graduates will be addressed. Topics include managerial and personal ethics, computer security, privacy, software reliability, personal responsibility for the quality of work, intellectual property, environment and health concerns, and fairness in the workplace.

(2) CSC 498: FINAL YEAR PROJECT II (3 Units C: PH 135)

Learning Outcomes

At the end of the course, students should be able to:

1. demonstrate technical skills in Computer Science;
2. demonstrate generic transferable skills such as communication and team work;
3. produce a technical report in the chosen project;
4. defend the written project report; and
5. appreciate the art of carrying out full-fledged research.

Course Contents
This is a continuation of CSC 497. This contains the implementation and the evaluation of the project. A formal written report, chapters 4-5 have to be approved by the supervisor. A final report comprising chapters 1 - 5 will be submitted to the department for final grading. An oral presentation is required.

(3) CSC 432: DISTRIBUTED COMPUTING SYSTEMS (2 Units R: LH 30)
Learning Outcomes
At the end of the course, students should have learned to:
1. summarise and describe general properties, challenges, and characteristics of distributed systems;
2. describe generally distributed algorithms for synchronisation and concurrency, coordination, transactions, and replication;
3. exemplify practical issues that need to be considered when designing, implementing, and debugging distributed systems;
4. compare replication schemes with respect to performance, availability, and consistency concerns; and
5. design, implement, and debug distributed systems.

Course Contents
Communication Mechanisms. Communication Protocols. RPC. RMI. Stream Oriented Communication. Synchronisation. Global State. Election. Distributed Mutual Exclusion. Distributed Transactions. Naming: Generic Schemes, DNS, Naming and Localisation. Replication and Coherence. Consistency Models And Protocols. Fault Tolerance: Group Communication, Two- And Three-Phase Commit, Checkpointing; Security: Access Control. Key Management. Cryptography. Distributed File Systems: NFS, Coda, etc. Application: ecommerce, global business strategies, online network business in a secure environment.

(4) IFT 310: MOBILE APPLICATION DEVELOPMENT (2 Units R: LH 15; PH 45)
Learning Outcomes

At the end of the course the students should be able to:

1. identify the basic knowledge on mobile application environment and technology;
2. explain the concepts and processes of mobile application development;
3. discuss design and development issues specific to mobile applications;
4. design and develop mobile applications, using development tools and environments;
5. evaluate the performance of a mobile application and give its result; and
6. appreciate perspectives of mobile applications and their impact.

Course Contents

Introduction to developing mobile applications. Mobile operating systems capabilities, application architecture, and major components, such as activities, services, broadcast receivers, etc. Development of interactive applications using widget libraries, web-based services. Basic concepts of 2D graphics and animation. An SQL database engine, and multithreading. Multiplatform mobile application development. Mobile application basics and features; Android application basics, UI design. Data storage; networking application design. Advanced application design (sensors, camera, GPS, Audio, etc.), graphics and games, webbased hybrid application design. Design and implement a simple mobile application for a given mobile platform. Metrics and methods to evaluate the performance of mobile applications. Mobile application perspectives and impact.

Lab Work: Demonstration of a Simple Mobile Application. Design and Development of interactive mobile applications. Demonstration of multiplatform mobile application development. Development of Android applications including UI design and data storage design. Demonstration of advanced mobile application design. Illustration of metrics for measuring the performance of mobile applications.

(5) SEN 410: SOFTWARE ARCHITECTURE AND DESIGN (2 Units R: LH 15; PH 45)

Learning Outcomes

At the end of this course, students should be able to:

1. describe design patterns, frameworks and architectures;
2. explain design of distributed systems and component based design; and
3. describe the techniques of designing for qualities such as reliability, performance, safety, security and reusability.

Course Contents

An in-depth look at software design. Continuation of the study of design patterns, frameworks, and architectures. Survey of current middleware architectures. Design of distributed systems using middleware. Component based design. Measurement theory and appropriate use of metrics in design. Designing for quality attributes such as reliability, performance, safety, security, reusability, etc. Measuring internal qualities and complexity of software. Evaluation and evolution of designs.

Lab Work: Practical demonstration of the use of design patterns, frameworks and architectures. Practical simulation of distributed systems. Illustration of component based design. Working with software design software. Use of software metrics measuring software.

(6) DUI-CMP 402: INTRODUCTION TO MACHINE LEARNING (3 Units C: LH 15, PH 4)

Learning outcomes

On completion of the course, the student should be able to:

1. **Describe** main concepts in machine learning.
2. **Discuss** and describe working with datasets prior to building algorithms.
3. **Practise** with learning algorithms on various dataset.
4. **Differentiate** among learning algorithms and their optimal application areas..
5. **Design** deep learning architecture for testing with real datasets

6. **Evaluate** the suitability of available learning algorithm in real life situations.

Course Contents

This course is structured into modules. Module 1 - Supervised vs Unsupervised Learning. Machine Learning vs Statistical Modelling. Supervised vs Unsupervised Learning. Module 2 - Supervised Learning I - K-Nearest Neighbours, Decision Trees, Random Forests, Reliability of Random Forests. Advantages & Disadvantages of Decision Trees. Module 3 - Supervised Learning II - Regression Algorithms, Model Evaluation. Model Evaluation: Overfitting & Underfitting. Understanding Different Evaluation Models. Module 4 - Unsupervised Learning- K-Means Clustering plus Advantages & Disadvantages. Hierarchical Clustering plus Advantages & Disadvantages. Measuring the Distances Between Clusters - Single Linkage Clustering. Measuring the Distances Between Clusters - Algorithms for Hierarchy Clustering. Density-Based Clustering. Module 5 - Dimensionality Reduction & Collaborative Filtering. Dimensionality Reduction: Feature Extraction & Selection. Collaborative Filtering & Its Challenges. Neural Networks and Deep learning models.

(7) DUI-CMP 406: SOCIAL MEDIA PROFICIENCY, BASIC VIDEO EDITING & WEB TRAFFIC ANALYTICS (2 Units C: LH 15, PH 45)

Learning Outcomes

On completion of the course, the student should be able to:

1. **Use** Facebook/Instagram to create website layouts and designs.
2. **Demonstrate** how to add content to web site page banner.
3. **Demonstrate** how to add followers, follow them and respond to them.
4. **Demonstrate** how to add other page administrators.
5. **Use** TikTok to achieve set goals.

6. **Demonstrate** how to Link to Facebook, Twitter, and TikTok communities, and post once to Instagram, Facebook, Twitter, and TikTok groups.
7. **Use** and manage WhatsApp groups to communicate efficiently.
8. **Use** Google Analytics 4 (GA4) effectively.
9. **Demonstrate** how to track Conversions in GA4.
10. **Use** Google Tag Manager effectively.
11. **Use** other analytical tools on social media effectively.

Course Contents

Introduction to social media: Logging & Using Facebook, Twitter, Instagram, Instant Messaging & Video Chats. Ethics (What to Post, Proper Conduct & Netiquette). Privacy & Security (Who Can View Pages & Other Restrictions). Web Presence via Facebook: Creating Page Layout & Site Designs. Adding Content, Pictures, Documents, Events & Facebook Live. Boosting Posts, Sharing Posts, Hash Tags & Tagging Boosting Posts, Sharing Posts, Hash Tags & Tagging. Introduction to Adobe Premiere Rush. Simple Video Editing skills: Clipping Video, joining videos together, Adding Texts, Logos, etc. Introduction to Google Analytics. Setting Up Google Analytics 4 (GA4). How to create Filtered views in GA4. Tracking Conversions in GA4. Measuring Protocol in GA4. Introduction to Google Tag Manager. Introduction to other Analytical Tools on Facebook, Twitter, etc for tracking web traffic.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