Ahmadu Bello University, Zaria
Faculty of Science,
Department of Mathematics

STUDENTS’ HANDBOOK

Undergraduate Computer Science Programme

2013 – 2017
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Introduction
Department of Mathematics, Ahmadu Bello University, Zaria, was established in October 1962. In its early years the Department was mainly offering combined honours degrees such as B.Sc. (Hons) Mathematics with Physics. The B.Sc. single (honours) programmes in Mathematics, Mathematics with Computer Science and Mathematics with Statistics started in the early 1970's. By the end of the 1970's and early 1980's, the Department had graduated Masters and Ph.Ds. in Computer Science, Mathematics and Statistics. However, Statistics and Computer Science programmes got discontinued due to lack of manpower. B.Sc. (Hons) in Mathematics with Computer Science was resuscitated in 2001 with eight students selected from the B.Sc. (Hons) Mathematics at 300 level. Also, B.Sc. (Hons) Statistics programme was resuscitated during the 2001/2002 academic session. M.Sc. and Ph.D. programmes in Statistics and Computer Science were also revived during the same session. Presently, the Department offers the following courses:

i. B.Sc. (Hons) Mathematics
ii. B.Sc. (Hons) Computer Science
iii. B.Sc. (Hons) Statistics
iv. Postgraduate Diploma in Computer Science
v. Postgraduate Diploma in Statistics
vi. M.Sc. Mathematics
vii. M.Sc. Computer Science
viii. M.Sc. Statistics
ix. Ph.D. Mathematics
x. Ph.D. Computer Science
xi. Ph.D. Statistics

This handbook will provide students with basic information about B.Sc. (Hons) Computer Science, guidelines and general matters for proper studentship. It provides the students with information relating to career opportunities in Computer Science. It also provides students with information about Departmental staff and opportunity to interact with the staff for effective learning in order to successfully graduate and live a meaningful life and become useful citizens. Our mission is to produce best graduates who would contribute selflessly
towards nation building. It is mandatory that every student should have a copy of this book.

**Applications of Computer Science**

Nowadays with the fast growing technology, Computers have become indispensible in almost all activities. They offer a wide range of functions and services. Few of such areas where Computer Science is applicable include the following:

- Education
- Medicine
- Business
- Banking
- Government
- Defense
- Communication
# Departmental Staff
## Full-Time Academic Staff

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name</th>
<th>Qualifications</th>
<th>Field of Research</th>
<th>Present Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dr. Babangida Sani</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Operational Research</td>
<td>Reader</td>
</tr>
<tr>
<td></td>
<td>(Head of Department)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Prof. Dasharath Singh</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Set Theory and Logic</td>
<td>Professor</td>
</tr>
<tr>
<td>3.</td>
<td>Prof. Goje Uba Garba Junaidu</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Semigroup Theory</td>
<td>Professor</td>
</tr>
<tr>
<td>4.</td>
<td>Prof. Basant Kumar Jha</td>
<td>B.Sc., M.A., Ph.D.</td>
<td>Computational Fluid Dynamics</td>
<td>Professor</td>
</tr>
<tr>
<td>5.</td>
<td>Prof. Jagadish Singh</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Space Dynamics</td>
<td>Professor</td>
</tr>
<tr>
<td>6.</td>
<td>Prof. Abba Ali Tajani</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Functional Analysis</td>
<td>Professor</td>
</tr>
<tr>
<td>7.</td>
<td>Dr. Abiodun Olusegun Ajibade</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Computational Fluid Dynamics</td>
<td>Reader</td>
</tr>
<tr>
<td>8.</td>
<td>Dr. Afolayan Ayodele Obininyi</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Computer Networking &amp; Cyber Security</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>9.</td>
<td>Dr. Adeku Musa Ibrahim</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Multisets Theory</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>10.</td>
<td>Dr. Abdul Mohammed Dikko</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Algebra, Rhotrix Theory</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>12.</td>
<td>Dr. Abubakar Yahaya</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Operational Research &amp; Statistical Inference</td>
<td>Lecturer I</td>
</tr>
<tr>
<td>15.</td>
<td>Mr. Armand Florentin-Donfack Kana</td>
<td>B.Sc., M.Sc.</td>
<td>Knowledge Representation &amp; Statistical Inference</td>
<td>Lecturer II</td>
</tr>
<tr>
<td>16.</td>
<td>Mrs. Aishetu Umar</td>
<td>B.Sc., M.Sc.</td>
<td>Space Dynamics</td>
<td>Lecturer II</td>
</tr>
<tr>
<td>17.</td>
<td>Mr. Chibekye Ngene Nnamani</td>
<td>B.Sc., M.Sc.</td>
<td>Multivariate Analysis</td>
<td>Lecturer II</td>
</tr>
<tr>
<td>18.</td>
<td>Mrs. Safinatu Ozohu Yisah</td>
<td>B.Sc., M.Sc.</td>
<td>Computer Networking</td>
<td>Lecturer II</td>
</tr>
<tr>
<td>S/N</td>
<td>Name</td>
<td>Qualifications</td>
<td>Field of Research</td>
<td>Present Rank</td>
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</tr>
<tr>
<td>23.</td>
<td>Mal. Ibrahim Muhammad Kalil</td>
<td>B.Sc., M.Sc.</td>
<td>Data Mining and NLP</td>
<td>Lecturer II</td>
</tr>
<tr>
<td>26.</td>
<td>Mrs. Fatima Binta Abdullahi</td>
<td>B.Sc., M.Sc.</td>
<td>Data Mining</td>
<td>Lecturer II</td>
</tr>
<tr>
<td>30.</td>
<td>Mrs. Amina Hassan Abubakar</td>
<td>B.Sc., M.Sc.</td>
<td>Cloud Computing</td>
<td>Assistant Lecturer</td>
</tr>
<tr>
<td>31.</td>
<td>Mal. Shehu Bala</td>
<td>B.Sc., M.Sc.</td>
<td>Design and Analysis of Experiment</td>
<td>Assistant Lecturer</td>
</tr>
<tr>
<td>32.</td>
<td>Mal. Isma'il Barroom Ahmad</td>
<td>B.Sc., M.Sc.</td>
<td>Moderate Applications</td>
<td>Assistant Lecturer</td>
</tr>
<tr>
<td>33.</td>
<td>Mal. Aminu Mustapha Bagiwa</td>
<td>B.Sc., M.Sc.</td>
<td>Semantic Web Applications Databases</td>
<td>Assistant Lecturer</td>
</tr>
<tr>
<td>34.</td>
<td>Mal. Jamilu Garba Yayari</td>
<td>B.Sc., M.Sc.</td>
<td>Design and Analysis of Experiments</td>
<td>Assistant Lecturer</td>
</tr>
<tr>
<td>35.</td>
<td>Mal. Aiyu Salisu</td>
<td>B.Sc., M.Sc.</td>
<td>Semantic Web Simulation Registry</td>
<td>Assistant Lecturer</td>
</tr>
<tr>
<td>36.</td>
<td>Mal. Abdussamad Tanko Imam</td>
<td>B.Sc., M.Sc.</td>
<td>Semigroup Theory</td>
<td>Assistant Lecturer</td>
</tr>
<tr>
<td>38.</td>
<td>Mal. Abba Muktar Junad</td>
<td>B.Sc.</td>
<td>Computational Mathematics</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>40.</td>
<td>Mal. Usman Ahmed Danbaba</td>
<td>B.Sc.</td>
<td>Biomathematics</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>41.</td>
<td>Mal. Abdullahi Abubakar Imam</td>
<td>B.Sc.</td>
<td>Computer Science</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>42.</td>
<td>Mal. Aminu Onumisi Abdulrasani</td>
<td>B.Sc.</td>
<td>Computer Science</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>43.</td>
<td>Mal. Muhammad Aliyu Kufena</td>
<td>B.Sc.</td>
<td>Computer Science</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>44.</td>
<td>Mal. Nura Abdullahi</td>
<td>B.Sc.</td>
<td>Computer Science</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>45.</td>
<td>Mal. Aiyu Yakubu</td>
<td>B.Sc.</td>
<td>Statistics</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>46.</td>
<td>Mr. Rueben Ohuwabakunni David</td>
<td>B.Sc.</td>
<td>Statistics</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>47.</td>
<td>Mr. Michael Ohuwakayo Oni</td>
<td>B.Sc.</td>
<td>Mathematics</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>48.</td>
<td>Mr. Yusuf Samuel Taino</td>
<td>B.Sc.</td>
<td>Mathematics</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>49.</td>
<td>Mal. Mohammed Yahaya Tanko</td>
<td>B.Sc.</td>
<td>Computer Science</td>
<td>Graduate Assistant</td>
</tr>
<tr>
<td>50.</td>
<td>Mal. Muhammad Lawal</td>
<td>B.Sc.</td>
<td>Computer Science</td>
<td>Graduate Assistant</td>
</tr>
</tbody>
</table>
### Visiting Academic Staff

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name</th>
<th>Qualifications</th>
<th>Field of Research</th>
<th>Present Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prof. Ninuola I. Akinwande</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Mathematical Modeling on Disease Dynamics</td>
<td>Professor</td>
</tr>
<tr>
<td>2</td>
<td>Prof. Shehu Usman Gulumbe</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Multivariate Analysis</td>
<td>Professor</td>
</tr>
<tr>
<td>3</td>
<td>Prof. Sunday Olumide Adewale</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Computer Networking &amp; Cyber Security</td>
<td>Professor</td>
</tr>
<tr>
<td>4</td>
<td>Prof. Osebekwin Ebenezer Asiribo</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Biostatistics</td>
<td>Professor</td>
</tr>
<tr>
<td>5</td>
<td>Prof. Moharram A. Khan</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Ring Theory</td>
<td>Professor</td>
</tr>
<tr>
<td>6</td>
<td>Prof. Haruna Yusuf</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Differential Equations</td>
<td>Professor</td>
</tr>
<tr>
<td>7</td>
<td>Dr. Bashir Maifada Yakasai</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Operational Research</td>
<td>Reader</td>
</tr>
<tr>
<td>8</td>
<td>Dr. Isa Audu</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Geo statistics</td>
<td>Reader</td>
</tr>
<tr>
<td>9</td>
<td>Dr. Yusuf Usman Abubakar</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Operational Research</td>
<td>Reader</td>
</tr>
<tr>
<td>10</td>
<td>Dr. Saleh E. Abdullahi</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Programming, Languages, Operating System</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>11</td>
<td>Dr. Mohammed Baba Hammawa</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Information Security</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>12</td>
<td>Dr. Mohammad Mustapha Yakut</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Fuzzy Topology</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>13</td>
<td>Dr. Aliya Mohammed Khalid Khattab</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Numerical Analysis</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>14</td>
<td>Dr. Bashir Ali</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Functional Analysis</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>15</td>
<td>Dr. Abdulhadi Aminu</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Max-algebra and Optimization</td>
<td>Senior Lecturer</td>
</tr>
<tr>
<td>16</td>
<td>Dr. Baba Ibrahim Mundi</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Fluid Dynamics</td>
<td>Lecturer I</td>
</tr>
<tr>
<td>17</td>
<td>Dr. Ibrahim Abdullahi</td>
<td>B.Sc., M.Sc., Ph.D.</td>
<td>Response Surface Methodology</td>
<td>Lecturer I</td>
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</tbody>
</table>

### Senior Non Teaching Staff

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name</th>
<th>Qualification</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mrs. U.M.N. Agbo</td>
<td>B. Ed.</td>
<td>Departmental Secretary</td>
</tr>
<tr>
<td>2</td>
<td>Mrs. B. A. Ibiteye</td>
<td>50 WPM</td>
<td>Chief Typist</td>
</tr>
<tr>
<td>3</td>
<td>Mal. M. Y. Nadabo</td>
<td>50 WPM</td>
<td>Senior Typist I</td>
</tr>
<tr>
<td>4</td>
<td>Mal. Shehu Umair</td>
<td>Diploma (Lib. Sci)</td>
<td>Departmental Librarian</td>
</tr>
<tr>
<td>7</td>
<td>Mal. Jamilu M. Sahabi</td>
<td>B.Eng.</td>
<td>Network Engineer</td>
</tr>
<tr>
<td>8</td>
<td>Mal. Jafaru Musa</td>
<td>National Diploma (Computer Science)</td>
<td>Senior Computer Operator</td>
</tr>
<tr>
<td>9</td>
<td>Mal. Adamu Yusuf</td>
<td>Diploma Lib. &amp; Inf. Sci.</td>
<td>Library Officer</td>
</tr>
<tr>
<td>10</td>
<td>Habiba Bala</td>
<td>Diploma Lib. &amp; Inf. Sci.</td>
<td>Library Officer</td>
</tr>
</tbody>
</table>
Junior Non Teaching Staff

<table>
<thead>
<tr>
<th>S/N</th>
<th>Name</th>
<th>Qualification</th>
<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Junaidu Mohammed</td>
<td>N.C.E. (Math. Comp.)</td>
<td>Chief House keeper</td>
</tr>
<tr>
<td>2</td>
<td>Kabir M. Bala</td>
<td>Diploma in Islamic Studies</td>
<td>Senior Office Assistant</td>
</tr>
<tr>
<td>3</td>
<td>Abu-Safiyan Suleiman</td>
<td>Sec. School Cert.</td>
<td>Senior Office Assistant</td>
</tr>
<tr>
<td>4</td>
<td>Masa'udu Abdullahi</td>
<td>Secondary School Cert. NECO, Drivers Liceince, Trade Test I, II, III</td>
<td>Driver/Mechanic</td>
</tr>
<tr>
<td>5</td>
<td>Yakubu Mahmud</td>
<td>Diploma in English Language</td>
<td>Office Assistant</td>
</tr>
<tr>
<td>6</td>
<td>Lawal Usman</td>
<td>Secondary School Cert. NECO</td>
<td>Office Assistant</td>
</tr>
</tbody>
</table>

Entry Requirements

The Department admits students into 100 level as well as 200 level for the B.Sc (Hons.) Computer Science based on their qualifications. In rare cases they may be admitted into upper levels.

I. For 100 level: Candidates must satisfy the general University and Faculty of Science requirements of five O’Level credits which must include: Mathematics, English, Physics and any two relevant science subjects from the following: Chemistry, Biology, Geography, etc at Senior Secondary School Certificate level or equivalence examination in at most two sittings.

II. For 200 level: Candidates must in addition to (I) above have an Advanced level (A’Level) or its equivalence in Computer Science and any other science subject.
Registration Guidelines

1. Fresh students are to come with the original copies of their relevant credentials to the Faculty/Department to collect admission letter and to be screened. Successful candidates would be informed of the procedure of registration with the Academic Office, the Faculty and the Department.

2. Students must be aware of time schedule for registration and have to be in possession of proper identification at all times.

3. Students have to consult their Level Coordinators before filling the Course Registration Forms.

4. Pre-requisites must be satisfied for courses that require such.

5. All courses are registered officially at designated places, except otherwise stated.

6. Unrestricted electives chosen outside those listed must be approved by the Department.

7. The minimum and maximum credit units registerable for regular students are 12 and 24 units respectively.

8. At the point of registration, a student is required to pay the National Association of Mathematics Students (NAMS) dues, purchase the Students’ Handbook and settle other charges as may be required from time to time.

9. Late registration attracts payment of penalty due; however, it cannot last beyond a quarter of the semester.

10. De-registration of undergraduate project is not allowed in the second semester.

11. Registration problems associated with ill-health may be entertained (if supported with medical report authenticated by the University Health Services).

12. Application for deferment of a session or a semester must be channeled through the Head of Department on time, for such requests to be tendered for consideration by the appropriate body(ies.).

13. A student is regarded as bona-fide only when the necessary registration forms have been duly submitted to the Departmental Registration Officer. Students are therefore advised to strictly adhere to registration guidelines in their own interest.
Examination Guidelines
Examinations are normally held at the end of each Semester. Examinations may take the form of written papers, oral examinations, practicals, submission of projects, any combination of these or any other form approved by the Senate. Continuous Assessment (C.A.) of course work is normally included in determining examination results.

Eligibility
In order to be eligible for admission into any examination, a student must have been registered for the course unit to be examined and must have fulfilled the University requirements concerning residence, fees or other related matters. At least 75% attendance is required in all classes, tutorials, laboratories, etc. to qualify to sit for examinations. The student must also fulfill other Departmental requirements regarding satisfactory completion of any course- work, practicals, assignments, projects or other matters.

Conducts
1. Candidates should be in the vicinity of the examination venue at least ten (10) minutes before the time of the examination. A candidate may be admitted up to forty five (45) minutes after the commencement of the examination but shall not be allowed extra time. On no accounts shall a student be allowed to leave the venue during the first hour or the last fifteen (15) minutes of the examination. A student must handover his/her scripts to the invigilator before leaving the examination room.

2. A student who leaves the examination room shall not be admitted back unless during the period of absence, he/she has been continually under the surveillance of an Invigilator/Assistant Invigilator.

3. A student shall come along with his/her I.D. Card and Examination Card to each examination and display them conspicuously on his/her desk. Each student shall complete an Attendance Form bearing his/her number, name and signature, which shall be collected by the Invigilator during each examination. No student is allowed to make any noise,
disturbance or to speak to any other student except as essential to the Invigilator.

4. No book, printed paper, written document, hand-set or any unauthorized materials shall be allowed into an examination room by any student, except as stated in the rules of the examination paper. A student must not during an examination directly or indirectly give assistance to any other student or permit any other student to copy from or otherwise use his/her papers. Similarly, a student must not directly or indirectly accept assistance from any other student or use any other student’s papers.

5. If any student is suspected to have infringed on any of the above provisions or in any way to have cheated or disturbed the conduct of the examinations, a report shall be made as soon as possible to the Faculty Examination Officer and the Dean. The Dean will cause the circumstances to the investigated and reported to the Board of Examiners. The student concerned shall be allowed to continue with the examinations, provided he/she does not cause any disturbance. However, the Board of Examiners shall subsequently recommend to the Faculty Board and Senate whether his/her paper should be accepted and as to any other action that shall be taken in the matter.

6. A student shall write his examination number and not his name distinctly in the space provided at the top of the cover of every answer booklet or separate sheets of paper. The use of scrap paper is strictly prohibited as all rough work must be done in the answer booklet and crossed neatly or in supplementary answer booklets which must be submitted to the Invigilator. Except for the printed question paper, student may not remove from the examination room or mutilate any paper or other materials supplied. At the end of the time allotted for the examination, each student shall cease from writing when instructed to do so and shall gather his /her scripts together for collection by the Invigilator.
RESULTS
Several terms are frequently used on an examination result chart.
The most outstanding and salient ones are the following:

i. Registered Credit Units (RCU)
   This is the sum of the credit units of the various courses
   registered by the student during the entire semester.

ii. Earned Credit Units (ECU)
   This is the sum of the credit units of all the courses passed
   by the student during the entire semester.

iii. Total Registered Credit Units (TRCU)
    This is the sum of the credit units of all the courses
    registered by the student from the first year of study to the
    particular semester under consideration.

iv. Grade Point (GP)
    This is a point system replacing ‘A, B, C, D and F' classification as in the Table below.

<table>
<thead>
<tr>
<th>Mark of Average</th>
<th>Letter Grade</th>
<th>Grade Point</th>
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<tbody>
<tr>
<td>70-100</td>
<td>A</td>
<td>5</td>
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<tr>
<td>60-69</td>
<td>B</td>
<td>4</td>
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<tr>
<td>50-59</td>
<td>C</td>
<td>3</td>
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<tr>
<td>45-49</td>
<td>D</td>
<td>2</td>
</tr>
<tr>
<td>0-44</td>
<td>F</td>
<td>0</td>
</tr>
</tbody>
</table>

v. Weighted Grade Point (WGP)
   This is the product of the Grade Point and the number of
   credit units.
   \[ WGP = GP * \text{Number of credit units}. \]

vi. Grade Point Average (GPA)
    This is the sum of the weighted Grade Point for a semester
    divided by the Registered Credit Unit for that semester i.e.
\[ \text{GPA} = \frac{\text{Sum of Weighted Grade Points for the semester}}{\text{Registered Credit Unit}} = \frac{\sum WGP}{RCU} \]

eight. Cumulative Grade Point Average (CGPA)

This is the sum of the weighted grade point of a student from the first semester of study to the particular semester under consideration divided by total credit units registered.

\[ \text{CGPA} = \frac{\text{Total Weighted Grade Point}}{\text{Total Registered Credit Unit}} = \frac{\text{TWGP}}{\text{TRCU}} \]

The CGPA provides a measure of the students’ academic standing.

**Calculation of GPA and CGPA**

Suppose a 100 level student of B.Sc. (Hons.) Computer Science has the following scores in the first semester examination.

<table>
<thead>
<tr>
<th>Course</th>
<th>Credit Units</th>
<th>Score %</th>
<th>Grade</th>
<th>GP</th>
<th>WGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 101</td>
<td>2</td>
<td>60</td>
<td>B</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>MATH 103</td>
<td>2</td>
<td>60</td>
<td>B</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>MATH 105</td>
<td>2</td>
<td>70</td>
<td>A</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>COSC101</td>
<td>2</td>
<td>50</td>
<td>C</td>
<td>3</td>
<td>06</td>
</tr>
<tr>
<td>GENS 101</td>
<td>1</td>
<td>49</td>
<td>D</td>
<td>2</td>
<td>02</td>
</tr>
<tr>
<td>GENS 103</td>
<td>2</td>
<td>43</td>
<td>F</td>
<td>0</td>
<td>00</td>
</tr>
<tr>
<td>GENS 107</td>
<td>1</td>
<td>35</td>
<td>F</td>
<td>0</td>
<td>00</td>
</tr>
<tr>
<td>CHEM 161</td>
<td>1</td>
<td>61</td>
<td>B</td>
<td>4</td>
<td>04</td>
</tr>
<tr>
<td>PHYS 121</td>
<td>2</td>
<td>45</td>
<td>D</td>
<td>2</td>
<td>04</td>
</tr>
<tr>
<td>GEOL 101</td>
<td>1</td>
<td>55</td>
<td>C</td>
<td>3</td>
<td>03</td>
</tr>
</tbody>
</table>

Taking into consideration the GP ratings in Table 1 above, and the definitions for WGP and GPA in (v) and (vi), \( \text{GPA} = \frac{\sum WGP}{RCU} = \frac{8 + 8 + \ldots + 0}{2 + 2 + \ldots + 1} = \frac{45}{16} = 2.8125 \approx 2.81 \)
Assuming that this particular candidate registered 20 credit units in the second semester and earned (passed) 18 credit units with a WGP total of 72 then GPA(2nd Semester) = \( \frac{72}{20} = 3.60 \)

\[ \text{CGPA} = \frac{45 + 72}{16 + 20} = 3.25. \]

Also for this candidate:

- RCU (1st Semester) = 16
- ECU (1st Semester) = 13
- RCU (2nd Semester) = 20
- ECU (2nd Semester) = 18
- TRCU = 36
- TECU = 31

Failure in any course shall be recorded as such and can only be redeemed by re-taking the course as carry-over and passing the examination, but both the initial GP and the “carry-over” GP shall count towards the CGPA. Subject to the conditions for withdrawal and probations, a student may continue to re-take the failed course unit(s) at the next available opportunity, provided the total number of credit units registered during that semester does not exceed 24. The number and titles of the core and elective course units to be examined shall be specified in the syllabus approved by the Senate of the University. The Faculty may determine from time to time, on the recommendation of the Department, and shall make any change known to the affected student by the commencement of the relevant teaching.

The method of determining continuous assessment marks: The weight given to continuous assessment mark is 40% for each course.
B.Sc. Computer Science degree is classified according to the students final CGPA as follows:

<table>
<thead>
<tr>
<th>CGPA</th>
<th>Classification of Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.50 - 5.00</td>
<td>First Class</td>
</tr>
<tr>
<td>3.50 - 4.49</td>
<td>Second Class (Upper Division)</td>
</tr>
<tr>
<td>2.40 - 3.49</td>
<td>Second Class (Lower Division)</td>
</tr>
<tr>
<td>1.50 - 2.39</td>
<td>Third Class</td>
</tr>
<tr>
<td>&lt; 1.5</td>
<td>Fail.</td>
</tr>
</tbody>
</table>
Students Industrial Work Experience (SIWES)
SIWES is an integral part of the undergraduate training in Computer Science programme and an essential requirement for graduation. It is usually undertaken at the end the first semester of 300 level. It is a six months programme at the end of which the student has to write, present and defend a technical report on what he/she learnt in the industry.

Deferment of SIWES
If a student wants to defer SIWES for a good course at the time it is due, he/she must forward a formal application to the Head of Department for consideration and possible approval. Only cases of deferments approved by the Department (HOD) would be processed and tendered for consideration.

Undergraduate Project
Every final year student in B.Sc. Computer Science programme shall undertake a research project in any field of interest besides the usual prescribed courses, to be supervised by a qualified lecturer. The report shall be prepared and submitted to the Departmental project coordinator in the appropriate format of four (4) bound copies. The report will also be orally examined on an appropriate date.

Graduation Requirements
For a student to graduate, he/she must pass all his/her core courses, earn at least 120 credit units (i.e. TECU ≥ 120) and have a Cumulative Grade Point Average of at least 1.50 (i.e. CGPA ≥ 1.50)
Course Structure

Structure and Duration

The duration of B.Sc. (Hons.) Computer Science programme is four years. There are two semesters of formal University Studies in each academic session. At 300 Level, a student is expected to go for at least 6 months Students Industrial Work Experience Scheme (SIWES) after completion of the first semester courses, at the end of which he/she has to write, present and defend a report on what he/she learnt in the industry. At 400 Level, each student undertakes a one year project in any field of interest besides the usual prescribed courses. A report on the project is also to be presented and defended.

Summary: B.Sc. Computer Science

<table>
<thead>
<tr>
<th></th>
<th>100 Level</th>
<th>200 Level</th>
<th>300 Level</th>
<th>400 Level</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Courses</td>
<td>22</td>
<td>27</td>
<td>20</td>
<td>31</td>
<td>100</td>
</tr>
<tr>
<td>(Departmental)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognate Courses (GENS)</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Restricted Electives</td>
<td>2</td>
<td>3</td>
<td>6</td>
<td>6</td>
<td>17</td>
</tr>
<tr>
<td>Unrestricted Electives</td>
<td>8</td>
<td>9</td>
<td>2</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>TOTAL</td>
<td>35</td>
<td>41</td>
<td>30</td>
<td>43</td>
<td>149</td>
</tr>
</tbody>
</table>

The above summary table shows that for a student to graduate he/she needs to register a total of at least 149 credit units of which 100 credits must be core.

The following gives a detailed breakdown of the courses in the curriculum on a semester-by-semester basis.

100 LEVEL – A MINIMUM OF 35 CREDIT UNITS.

- Core courses (Departmental) : 22
- Core courses (General Studies) : 03
- Restricted Elective : 02
- Unrestricted Electives : 08
- Total : 35
### Core Courses (Departmental)

#### 1\(^{st}\) Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH101</td>
<td>Sets and Number System</td>
<td>2</td>
<td>O/L Maths</td>
</tr>
<tr>
<td>MATH103</td>
<td>Trigonometry and Co-ordinate Geometry</td>
<td>2</td>
<td>&quot;</td>
</tr>
<tr>
<td>MATH105</td>
<td>Differential and Integral Calculus</td>
<td>2</td>
<td>&quot;</td>
</tr>
<tr>
<td>COSC101</td>
<td>Introduction to Computing</td>
<td>2</td>
<td>&quot;</td>
</tr>
<tr>
<td>PHYS111</td>
<td>Mechanics</td>
<td>2</td>
<td>O/L Physics</td>
</tr>
<tr>
<td>PHYS131</td>
<td>Heat and properties of matter</td>
<td>2</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

#### 2\(^{nd}\) Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH102</td>
<td>Algebra</td>
<td>2</td>
<td>O/L Maths.</td>
</tr>
<tr>
<td>MATH104</td>
<td>Conic Sections and Application of Calculus</td>
<td>2</td>
<td>&quot;</td>
</tr>
<tr>
<td>MATH106</td>
<td>Vectors and Dynamics</td>
<td>2</td>
<td>&quot;</td>
</tr>
<tr>
<td>STAT102</td>
<td>Introductory Statistics</td>
<td>2</td>
<td>&quot;</td>
</tr>
<tr>
<td>PHYS124</td>
<td>Geometric and Wave Optics</td>
<td>2</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

#### Restricted Elective

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS122</td>
<td>Electricity, Magnetism and Modern Physics</td>
<td>2</td>
<td>O/L Physics.</td>
</tr>
</tbody>
</table>

#### Cognate Courses (General Studies)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENS101</td>
<td>Nationalism</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>GENS103</td>
<td>English and Communication Skills</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

#### Electives at 100 Level

1\(^{st}\)/2\(^{nd}\) Semester

A minimum of eight (8)-credit units chosen from the following subject areas: Biology, Chemistry, STAT101, GENS102 and GENS107

### 200 Level – A Minimum of 41 Credit Units

- Core courses (Departmental) : 27
- Core courses (General Studies) : 02
- Restricted Electives : 03
- Unrestricted Electives : 09
- Total : 41
Core Courses (Departmental)

1st Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH201</td>
<td>Mathematical Methods I</td>
<td>3</td>
<td>MATH105 or equiv.</td>
</tr>
<tr>
<td>MATH207</td>
<td>Linear Algebra I</td>
<td>3</td>
<td>MATH102 or equiv.</td>
</tr>
<tr>
<td>COSC211</td>
<td>Object-Oriented Programming I</td>
<td>3</td>
<td>COSC101 or equiv.</td>
</tr>
<tr>
<td>COSC203</td>
<td>Discrete Structures</td>
<td>3</td>
<td>MATH101 or equiv.</td>
</tr>
<tr>
<td>COSC205</td>
<td>Digital Logic Design</td>
<td>3</td>
<td>COSC101 or equiv.</td>
</tr>
</tbody>
</table>

2nd Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC212</td>
<td>Object-Oriented Programming II</td>
<td>3</td>
<td>COSC101 or equiv.</td>
</tr>
<tr>
<td>COSC204</td>
<td>Computer Organization and Assembly Language</td>
<td>3</td>
<td>COSC101 or equiv.</td>
</tr>
<tr>
<td>STAT202</td>
<td>Continuous Probability Distributions and Distribution Techniques</td>
<td>3</td>
<td>STAT101 or equiv.</td>
</tr>
<tr>
<td>COSC208</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
<td>COSC101</td>
</tr>
</tbody>
</table>

Cognate Course (General Studies)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENS202</td>
<td>Entrepreneurship and Innovation</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Restricted Departmental Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH209</td>
<td>Numerical Analysis I</td>
<td>3</td>
<td>MATH104 or equiv.</td>
</tr>
</tbody>
</table>

Unrestricted Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC206</td>
<td>Human Computer Interaction</td>
<td>2</td>
<td>COSC101 or equiv.</td>
</tr>
<tr>
<td>MATH208</td>
<td>Linear Algebra II</td>
<td>3</td>
<td>MATH102 or equiv.</td>
</tr>
</tbody>
</table>

A minimum of nine (9) credit units chosen from any of the following subject areas: Biology, Chemistry, Mathematics, Statistics and Physics.

300 Level – A Minimum of 30 Credit Units

- Core courses (Departmental) : 20
- Core courses (General Studies) : 02
- Restricted Electives (Departmental) : 06
- Unrestricted Electives (minimum) : 02
- Total : 30
Core Courses

1st Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC301</td>
<td>Data Structures and Algorithm</td>
<td>3</td>
<td>COSC211</td>
</tr>
<tr>
<td>COSC303</td>
<td>Computer Architecture</td>
<td>3</td>
<td>COSC205</td>
</tr>
<tr>
<td>COSC305</td>
<td>Systems Analysis and Design</td>
<td>2</td>
<td>COSC301</td>
</tr>
<tr>
<td>COSC309</td>
<td>Database Management systems</td>
<td>3</td>
<td>COSC203</td>
</tr>
<tr>
<td>COSC311</td>
<td>Organization of Programming Languages</td>
<td>3</td>
<td>COSC211</td>
</tr>
</tbody>
</table>

2nd Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC300</td>
<td>SIWES</td>
<td>6</td>
</tr>
</tbody>
</table>

Cognate Course (General Studies)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENS302</td>
<td>Business Creation and Growth</td>
<td>2</td>
</tr>
</tbody>
</table>

Restricted Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC307</td>
<td>Web Application Engineering I</td>
<td>3</td>
<td>COSC101</td>
</tr>
<tr>
<td>MATH311</td>
<td>Mathematical Modeling</td>
<td>3</td>
<td>MATH201</td>
</tr>
</tbody>
</table>

Unrestricted Electives

A minimum of two (2) credit units chosen from any of the following:
Any relevant 300 level course in the Faculty of Science, Department of Electrical Engineering, Department of Economics, and Department of Business Education.

400 LEVEL – A MINIMUM OF 43 CREDIT UNITS

- Core courses (Departmental) : 31
- Restricted Electives : 06
- Unrestricted Electives (minimum) : 06
- Total : 43

Core Courses

1st Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC400</td>
<td>Project</td>
<td>3</td>
<td>COSC300</td>
</tr>
<tr>
<td>COSC401</td>
<td>Algorithms and Complexity Analysis</td>
<td>3</td>
<td>COSC301</td>
</tr>
<tr>
<td>COSC403</td>
<td>Software Engineering</td>
<td>3</td>
<td>COSC305</td>
</tr>
<tr>
<td>COSC405</td>
<td>Web Application Engineering II</td>
<td>2</td>
<td>COSC307</td>
</tr>
<tr>
<td>COSC407</td>
<td>Data Communications and Networks</td>
<td>3</td>
<td>COSC205</td>
</tr>
<tr>
<td>COSC411</td>
<td>Operating Systems</td>
<td>3</td>
<td>COSC204</td>
</tr>
</tbody>
</table>
2nd Semester

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC400</td>
<td>Project</td>
<td>3</td>
<td>COSC300</td>
</tr>
<tr>
<td>COSC402</td>
<td>Formal Methods and Software Development</td>
<td>3</td>
<td>MATH201</td>
</tr>
<tr>
<td>COSC404</td>
<td>Network Design and Management</td>
<td>3</td>
<td>COSC307</td>
</tr>
<tr>
<td>COSC406</td>
<td>Advanced Database Systems</td>
<td>2</td>
<td>COSC309</td>
</tr>
<tr>
<td>COSC408</td>
<td>Compiler Construction</td>
<td>3</td>
<td>COSC311</td>
</tr>
</tbody>
</table>

Restricted Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credit Units</th>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>COSC409</td>
<td>Professional and Social Aspects of Computing</td>
<td>3</td>
<td>COSC206</td>
</tr>
<tr>
<td>COSC416</td>
<td>Simulation Methodology</td>
<td>3</td>
<td>STAT202</td>
</tr>
</tbody>
</table>

Unrestricted Electives

A minimum of 6 credit units, chosen from any of the following 400 level subject areas: Computer Science (COSC415,COSC413,COSC414,COSC412), Electrical Engineering, Physics, Electronics, Economics, Business Administration, Mathematics, Statistics or other relevant sciences depending upon the availability of facilities and resources.

Undergraduate Syllabus for B.Sc. (Hons.) Computer Science

100-Level First Semester Courses

**COSC101 Introduction to Computing**

**Prerequisite: O-Level Mathematics**

Introduction to computer systems. Components of computer systems and their functions. Windows operating systems and its utilities. Hands-on exposure to Office application software (MS Office or Open Office): Word processing, spreadsheets, presentation graphics and databases. Introduction to and use of Internet tools and technologies.

**Suggested Lab work**

Lecturers should develop laboratory exercises and assignments targeted at providing hands-on practical experience on all topics in the syllabus. The exercises should cover the typical tasks that students do with computers throughout their studies.
Textbooks
2. J.J. Parsons and D. Oja, Practical Computer Literacy, Thompson Learning, 2005

MATH101 – Sets and Number System (2 Credit Units)
Prerequisite – O/Level Mathematics
Sets: Definition of a set, finite and infinite sets, equality of sets, subsets, union, intersection, universal set, complements, empty set, Venn diagram. Symmetric difference, power sets and De-Morgan theorems. Inclusion-Exclusion principle. Elements of relations and functions.

Some Properties of number systems: Natural numbers, integers, rationals, irrationals and reals. Order relations in the set of real numbers. Open and closed intervals on the number line.

Complex Numbers: Definition of a complex number, addition, multiplication and division. Geometric interpretation modulus and conjugation. Polar representation, De-Moivre’s theorem, n\text{th} roots of a complex number, n\text{th} roots of unity.

Textbooks
MATH103 – Trigonometry and Coordinate Geometry (2 Credit Units)

Prerequisite – O/Level Mathematics
Circular Measures: Trigonometric ratios of angles of any magnitude, inverse trigonometric functions.

Addition formulae: Sin (A+B), cos(A+B), tan(A+B) and their proofs. Multiple and half angles, solutions of simple trigonometric equations. Factor formulae. Solution of triangles, heights and distances (including three-dimensional problems)
Plane Polar Coordinates: Relation between polar and Cartesian coordinates, plotting and sketching of simple curves whose polar equations are known.

Coordinate Geometry of lines and Circles: Pair of straight lines and system of circles. (Emphasis on concepts rather than formulae).

Text books

MATH105 – Differential and Integral Calculus (2 Credit Units)

Prerequisite – O/Level Mathematics.
Functions of a real variable: Odd, even, periodic functions and their symmetries, graphs, limits and continuity (Intuitive treatment only)
Integration: Integration as the inverse of differentiation, techniques of integration in general, definite integral (Evaluation only).
Text books

PHYS111 Mechanics
Prerequisite – O/Level Physics.
Units and dimensions; Dimension methods for checking correctness of equations and for deriving simple relations. Additions and subtraction of vectors, projectiles, Newton laws, conservation laws, Elastic collisions, work, energy and power. Circular motion, simple harmonic motion, motion of rigid bodies, statics Gravitational potential, circular orbit, escape velocity.

PHYS131 Heat and Properties of Heat
Prerequisite – O/Level Physics.

100-Level Second Semester Courses
MATH102 – Algebra (2 Credit Units)
Prerequisite – O/Level Mathematics
Quadratic and other polynomial functions: Elementary properties of quadratic expressions, roots of quadratic equations, application to symmetric functions, polynomial functions of third and fourth degrees, remainder theorem, location of roots.

Permutation and combination: Notion of Factorials, \(^nP_r\), \(^nC_r\), and simple applications, mathematical induction principle and applications.
Binomial Theorem: Expansion of all rational index, interval of convergence, approximations and errors.

**Textbooks**

**MATH104 – Conic Sections and Application of Calculus (2 Credit Units)**

**Prerequisite – O/Level Mathematics.**
Conics: Properties of parabola, ellipse, hyperbola, rectangular hyperbola, their Cartesian and parametric equations, problems involving elimination of parameters, tangents and normals. Rate of Change: Velocity, acceleration and other rates.
Curve Sketching: Asymptotes, maxima and minima. Small increments, approximations and errors. Newton’s approximation, simple application of integration to areas and volumes.
Differential equations: First order differential equations only.

**Textbooks**

**MATH106 – Vectors and Dynamics (2 Credit Units)**

**Prerequisite – O/Level Mathematics**
Vectors: Geometric representation of vectors in 1-3 dimensions, components, direction cosines. Addition, scalar multiplication, linear
independence and dependence of vectors. Scalar and vector products of vectors. Differentiation and integration of vectors w.r.t a scalar variable.


Text books

STAT102 INTRODUCTORY STATISTICS II (2 CREDIT UNITS)

Prerequisite – O/Level Mathematics.
Random experiment, Sample space, event space, definitions of probability, conditional probability, addition and multiplication theorems, definition of random variable (discrete and continuous), mathematical expectations of a random variable, addition and multiplication theorems of expectation, definition of moment, relationship between raw moments and central moments, the bi-variate frequency distribution, fitting of curves by method of least squares, concepts of correlation and regression and their coefficients, the rank correlation coefficient.

Text Books
**PHYS122 Electricity, Magnetism and Modern Physics**

**Prerequisite – O/Level Physics.**

Electric force; Field and potential, Electric flux and Gauss’s therem. Capacitancies, current electricity, magnetic force, magnetic effects of currents, magnetic materials, electro magnetic induction, Alternating current, Planck’s constant quanta of light energy, photo electric effect, Radioactivity, Nuclear composition, binding energy, Nuclear fission and fussion. Thermionic emission, rectification by diodes, transistor.

**PHYS124 Geometric Wave and Optics**

**Prerequisite – O/Level Physics.**

Reflection, refractive index, Smells law measurement of refractive index, total internal reflection, air cell. Refraction through prism, minimum deviation. Tens formula, Lenses in contact, Newton formula. Spherical and chromatic aberrations, power of lenses, Dispersive Powers. Classification of spectra, Optical instruments, interference phenomenon, Newton rings, Polarization, Moli’s law, polaroids

**200-Level First Semester Courses**

**COSC211 Object-Oriented Programming I**

**Prerequisite: COSC101 or Equivalence**

Overview of computers and computing; Introduction to object-orientation as a technique for modeling computation. Introduction of a typical object-oriented language, such as Java; Basic data types and operators; Basic object-oriented concepts; Introduction to Strings; Simple I/O; Logical expressions, control structures, algorithms and problem solving; Arrays; Simple recursive algorithms; inheritance; polymorphism.

**Suggested 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 programs involving inheritance and polymorphism.
Textbooks

COSC203 Discrete Structures
Prerequisite: MATH101 or Equivalence

Textbooks

COSC205 Digital Logic Design
Prerequisite: COSC101 or Equivalence.
Introduction to information representation and number systems. Boolean algebra and switching theory. Manipulation and minimization 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 FPGA.s.

Textbooks


<table>
<thead>
<tr>
<th>MATH201 – Mathematical Methods - I (3 Credit Units)</th>
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<td><strong>Prerequisite – MATH105 or equivalence</strong></td>
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Applications of Calculus: Revision of different techniques of differentiation, successive differentiation, Leibniz’s theorem, Taylor and Maclaurin series. Tangents and normals to plane curves, curvature, Definite integrals. Methods of integration, reduction formulae, lengths of arc of a plane curve. Area enclosed by a plane curve.


Partial Differentiation: Real valued functions of two and three variables. Partial derivatives, chain rule, Jacobian. Extrema, Lagrange’s multipliers, increments, differentials and linear approximations.
Text books

MATH207 – Linear Algebra I (3 Credit Units)
Prerequisite – MATH102 or equivalence
Matrices: Definition, types of matrices, algebra of matrices, matrix as a sum of symmetric and skew symmetric matrices. Elementary operations of matrices and echelon form, equivalence matrices. Inverse of a matrix.


Text books

MATH209 – Numerical Analysis I (3 Credit Units)
Prerequisite – MATH105
Accuracy in numerical calculations: errors and their sources, error accumulation in different operations.
Finite differences: difference operators and difference table.
Evaluation of functions: using series approximation, solution of polynomial, algebraic and transcendental equations, curve fitting.
Textbooks

200 - Level Second Semester Courses

<table>
<thead>
<tr>
<th>COSC212 Object-Oriented Programming II</th>
</tr>
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<tbody>
<tr>
<td><strong>Prerequisite:</strong> COSC102 or Equivalence</td>
</tr>
<tr>
<td>Advanced object-oriented programming - polymorphism, abstract classes and interfaces: Program organization using packages/namespaces; Use of API – use of iterators/enumerators, List, Stack, Queue from API; Recursion; Event-driven programming.</td>
</tr>
</tbody>
</table>

**Suggested Lab work**
Programming assignments leading to extensive practice in problem solving and program 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.

**Textbooks**
**COSC204 Organization and Assembly Language**

**Prerequisite: COSC101 or Equivalence**
Introduction to computer organization. Signed and unsigned number representation, character representation, ASCII codes. Assembly language programming, instruction format and types, memory and I/O instructions, dataflow, arithmetic, and flow control instructions, addressing modes, stack operations, and interrupts. Datapath and control unit design. RTL, microprogramming, and hardwired control. Practice of assembly language programming.

**Suggested Lab work**
Programming assignments to practice MS-DOS batch programming, Assembly Process, Debugging, Procedures, Keyboard input, Video Output, File and Disk I/O and Data Structure.

**Textbooks**

**COSC206 Human Computer Interaction**

**Prerequisite: COSC101 or Equivalence**
Foundation of HCI, principles of GUI, GUI toolkits. Human-centered software evaluation and development; GUI design and programming.

**Textbooks:**
COSC208 Introduction to Artificial Intelligence

Prerequisite: COSC101 or Equivalence
Introduction to the types of problems and techniques in Artificial Intelligence. Problem-Solving methods. Major structures used in Artificial Intelligence programs. Study of knowledge representation techniques such as predicate logic, non-monotonic logic, and probabilistic reasoning. Examples of expert systems. Introduction to natural language understanding and various syntactic and semantic structures. Expert systems. Introduction to computer image recognition.

Textbooks

MATH208 – Linear Algebra II (3 Credit Units)

Prerequisite – MATH102

Linear Mappings and Matrices: General linear transformation of n-dimensional into m-dimensional space, matrix representation of a linear map, similar matrices and change of basis. Eigenvalues and eigenvectors. Characteristic polynomial and characteristic equation. Caley-Hamilton theorem. Orthogonal diagonalisation.

Canonical Forms: Primary decomposition theorem, Triangular Jordan and Rational forms for linear operator (square matrices). Quadratic and bilinear forms.
Text books

STAT202 - Continuous Probability Distributions and Distribution Techniques (3 Credit Units)
Prerequisite – STAT102
Univariate continuous probability distributions such as Normal, Uniform, exponential, type I and type II beta and gamma distributions, various properties of these distributions, fitting of normal distribution. Concept of Bi-variate probability distribution, joint, marginal, conditional probability distribution, covariance and correlation of bi-variate r.v. sampling distribution and standard errors of statistics, distribution of functions of random variables using the techniques such as cumulative distribution function technique, moment generating function technique and transformation technique.

Text Books

300-Level First Semester Courses
COSC301 Data Structures and Algorithm
Prerequisite: COSC212 or Competence in Programming
Review of object-oriented concepts; Basic algorithm analysis - the big-O notation; Fundamental data structures – implementation strategies for stacks, queues and lists; Recursion; Implementation strategies for tree and graph algorithms; Hash tables; Application of data structures.
Suggested Lab work
Programming assignments leading to extensive practice in problem solving and program development involving the use of the various data structures implemented in the course.

Textbooks

COSC303 Computer Architecture
Prerequisite: COSC205
Memory hierarchy and cache memory. Integer and floating point arithmetic. Instruction and arithmetic pipelining, superscalar architecture. Reduced instruction set computers. Parallel architectures and interconnection networks.

Textbooks

COSC305 Systems Analysis and Design
Prerequisite: COSC211 or Competence in Programming
The software development life cycle: conception, business case, business context, system requirements, requirements analysis, systems analysis, design, implementation, testing, deployment, maintenance. The Unified Modeling Language (UML): models, use case diagrams, activity diagrams and state chart diagrams, sequence and collaboration diagrams, class diagrams, component diagrams. Managing the process: customers, organization types, project
management, teams and team dynamics, computer assisted software engineering (CASE) tools, documentation.

**Suggested Lab Work**
Analysis and design assignments leading to extensive practice in the use of UML and CASE tools.

**Textbooks**

<table>
<thead>
<tr>
<th>COSC307 Web Applications Engineering I</th>
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<tr>
<td><strong>Prerequisite:</strong> COSC211 or Competence in Programming</td>
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<tr>
<td>The Internet (brief history, Internet protocols and Internet services); The Web architecture (Client-server architecture, multi-tier architecture, URL); XHTML; DHTML (Cascaded Style Sheet, JavaScript, DOM); Web interface and interactivity design principles and practice. Incorporating multimedia content into Web pages (using Photoshop, Flash or similar tools).</td>
</tr>
</tbody>
</table>

**Textbooks**
COSC309 Database Management Systems

Prerequisite: COSC211

Suggested Lab work

Textbooks

COSC311 Organization of Programming Languages

Prerequisite: COSC211 or Competence in Programming

Textbooks
MATH311 – Mathematical Modeling (3 Credit Units)

**Prerequisite – MATH201**

**Text books**

400-Level First Semester Courses

**COSC400 Project**

**Prerequisite: COSC300**
The project aims to provide experience with planning, executing and formally reporting on a substantial computing task within a set time. Students will develop their understanding of relevant areas of computing and their capabilities in the practical engineering and writing activities involved, and demonstrate their competence as candidate computing professionals.

**Textbooks**
1. CW Dawson, Projects in Computing and Information Systems, Addison-Wesley, 2005

**COSC401 Algorithm and Complexity Analysis**

**Prerequisite: COSC301**
Introduction to algorithms and review of data structures; fundamentals of algorithm analysis; Analysing recursive and non-recursive algorithms; Algorithm design techniques: brute-force, divide-and-conquer, greedy algorithms, dynamic programming.
search techniques; NP-complete problems and approximation algorithms.

Textbooks:
3. Useful Resources:
   http://www.cs.ucsd.edu/classes/wi05/cse101/

COSC403 Software Engineering

Prerequisite: COSC305
Fundamental design concepts, design notations, and architectural design methods for large-scale software systems. Several design examples of their use, comparisons among them. Concepts of information hiding, data abstraction, concurrency, and object-oriented software construction.

Textbooks

COSC405 Web Application Engineering II

Prerequisite: COSC307
Assignments and projects should be given to enable students design and implement non-trivial data-driven Web applications.
Textbooks

COSC407 Data Communications and Network

**Prerequisite: COSC205**
Introduction to computer networks and layered architectures: connectivity, topology, circuit and packet switching, TCP/IP and ISO models; Application layer: C/S model, DNS, SMTP, FTP, WWW, socket programming and network security; Transport layer: TCP and UDP, congestion control; Network layer: internetworking, addressing and routing algorithms and protocols; Data link layer: framing, flow and error control protocols, PPP, MAC and LANs; Physical layer: principles of data communications, circuit switching, coding, multiplexing and transmission media. Network security: fundamentals of cryptography, secret and public key algorithms, authentication protocols.

**Suggested Lab work**
The lab involves several projects to gain hands-on experience with network devices, programming and tools. More specifically, it provides students with the opportunity to: Setup various servers such as DNS, DHCP, Web Servers on Windows/Linux platforms; Develop simple client/server network applications using sockets; Create simple web pages; Simulate network; Analyze various protocols by capturing packets; Measure network utilization under varied situations; Use various network-related commands; Configure switches and routers.

Textbooks
COSC409 Professional and Social Aspects of Computing

Prerequisite: COSC206
Professional aspects; professions and the professional; professional institutions; professional ethics and responsibilities; the computer professional as expert witness. Standards, best practice. Legal background, sources of law; civil and criminal law. Intellectual property rights, software copyright, patents, designs, trade marks and passing off; copyright and webpages, Internet domain names, protection of computer imagers and icons, jurisdiction; confidentiality. Data protection law; freedom of movement of personal data; privacy in telecommunications. Computer crime; fraud; computer misuse; viruses; threatening emails; pornography; grooming in chat rooms. Social aspects of the workplace/society at large. The impact of IT on society.

Textbooks

COSC411 Operating Systems

Prerequisite: COSC301
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 synchronization; Memory management and virtual memory; File systems; I/O systems; Security and protection; Case-study.

Suggested Lab work
Implementation of user-defined utilities/commands for UNIX by writing systems programs using different types of system calls including those for file/directory management, process management, signal management, and client/server management. Also involve practice on various aspects of shell environment and shell programming.
Textbooks

**COSC413 Computational Science and Numerical Methods**

**Prerequisite: MATH209**
History and importance of computational science, overview of application areas, review of required skills. High-performance computing: processor architectures, memory systems for high performance, input/output devices, pipelining, parallel languages and architectures. Scientific visualization: presentation of results, data formats, visualization tools and packages. Application of high-performance computing to scientific and engineering problems.

**Textbooks**

**400-Level Second Semester Courses**

**COSC402 Formal Methods in Software Development**

**Prerequisite: COSC212**
Mathematical foundations for formal methods. Formal languages and techniques for specification and design, including specifying syntax using grammars and finite state machines. Analysis and verification of specifications and designs. Use of assertions and proofs. Automated program and design transformation.
Textbooks
4. Useful Resources:

**COSC404 Network Design and Management**

**Prerequisite:** COSC205
Overview of network design and management; Design methodologies; Network management strategies; Network configuration management; Network management protocols: SNMP, and RMON; Network management tools and systems; Network management applications; Desktop and web-based network management; Network troubleshooting.

**Suggested Lab Work**
A closed lab with hands-on exercises using state-of-the-art tools in the design, analysis and troubleshooting computer networks.

**Textbooks**

**COSC406 Advanced Database Systems**

**Prerequisite:** COSC309
Textbooks

COSC408 Compiler Construction

**Prerequisite: COSC212**


Textbooks
3. NUC BMAS. Benchmarks and Minimum Academic Standard (Science), Published by the National Universities Commission, April 2007.
4. Career Space is a European Consortium of over 20 universities all over Europe. They established a working group on ICT curriculum development. Information about this can be reached at [http://career-space.com/cdguide/](http://career-space.com/cdguide/)
COSC416 Simulation Methodology

**Prerequisite: STAT202**
Introduction and comparison with other techniques, discrete simulation model, generation of pseudo random numbers, statistical testing. Implementation of queing theory, simulation languages and packages. System Models, System Studies, Techniques of System simulation, continuous system simulation, introduction to GPSS.

**Text Books**
2. Introduction to Simulation, Payer T.A., McGraw Hall

STAT412 – Operations Research (3 Credit Units).

**Prerequisite – MATH311**
Classical methods of optimization, Maxima and minima, Lagranges’ multipliers. Linear programming: Convex sets and functions, simplex and revised simplex methods, duality theory, applications. Linear programming applications to diet problems, transportation problems, manufacturing problems, Network Analysis, etc.

**Text Books**
1. Operations Research, Sharma, J.K., Macmillan India.
2. Operations Research, Swaroop, Gupta, P.K. and Mohan, M., Sultan Chand and Sons, New Delhi, India.

Service Courses

COSC264 – Fundamentals of Data Processing (2 Credit Units).

**Prerequisite – O/L MATHS**
Data processing cycle & Operations, Developments in Data processing, storage media, punched-card recording & processing, electronic data processing, communicating with the computer, computer codes & arithmetic, flowcharts & programming techniques, data structure.
Text Book

COSC265 – Introducing Computer (2 Credit Units).
Prerequisite – O/L MATHS
Computer (definition, types generation, history)
Computer (structure, components, number system)
Computer Software (type, application, systems, packages, languages, machine, symbolic high level languages, most popular languages)
Networks Topology; star, ring mesh, bus
Popular packages (database, spreadsheet, word processing, Dos windows with practice on information retrieval using data based management system commands)
Computer applications in Library and Nursing

Text Book

COSC344 – Computer Knowledge and FORTRAN Programming (3 Credit Units).
Prerequisite – O/L MATHS
Binary, Octal and Hexadecimal number systems, conversion complement of numbers. Representation of negative numbers, Digital computers, main functional elements of a computer (memory, central and arithmetic units, input-output devices; backing storages). Information in the core store.

Binary coded decimal, fix and floating point representations, programming languages (short summary of the machine code. Assembly, machine and problem oriented languages). The flow
chart language, Loops, interaction. The basic FORTRAN Numerical data, arithmetic, arrays, input-output, control statements, sementation of programmes, statement function, function and subroutine segments. Common, equivalence statements.

Text Book

General Matters
The following procedures are to be strictly followed under the appropriate situation.

Illness
While on campus, a student who falls sick should seek for immediate medical attention at the University Sick Bay. When necessary, the Sick Bay may refer serious cases to the Teaching Hospital for further specialist treatment. Whenever the medical condition of a student necessitates absence from academic activities, the Department (HOD) should accordingly be notified in writing and upon resumption for normal academic work, appropriate medical report must be presented. Any student who falls ill during an examination should immediately seek medical attention at the Sick Bay and has to obtain appropriate medical report and forward it to the Department (HOD) as soon as possible. If the sick student must seek for further medical assistance outside the University Health Services, the Department (HOD) must be formally informed in writing before leaving the University or Zaria. Outside the University Campus or Zaria (e.g. while at home on holidays) if as a result of ill-health, a student is likely to be late for registration, the Department must be informed early enough. Upon resumption, supporting evidence(s) (e.g. medical report which has to be authenticated by the University Health Services) must be presented.
Deferment of Semester/Session
A student who for a good cause wishes to defer a semester or a whole session must put a formal application to the Dean of the Faculty of Science through the Head of Department (HOD) for consideration and approval. This must be done in good time for such request to be tendered for consideration and final approval.

Warning, Probation and Withdrawal:
The academic standing of a student is determined by the Cumulative Grade Point Average (CGPA). The minimum tolerable CGPA is 1.50 for classified first degree Programmes and 2.40 for non-classified first degree programmes. B.Sc. Computer Science Degree is classified.

I. Warning
A student is warned if his/her CGPA drops below the minimum tolerable level for the first time. This warning is usually in the form of verbal advice by the Level Coordinator and the student should be made to be fully aware of the implication of dropping below the minimum tolerable CGPA in the next semester examinations.

II. Probation
A student is placed on probation if his/her CGPA drops below the minimum tolerable level for two consecutive semesters i.e. (CGPA < 1.5).

III. Withdrawal
Withdrawal of a candidate from his/her programme is recommended to the Faculty Board of Examiners from the Department where the CGPA of the candidate drops below the minimum tolerable level (CGPA < 1.5) for four (4) consecutive semesters. The Faculty Board usually ratifies this recommendation and communicates same to the University Senate for approval. Withdrawal from a programme can also be made on grounds of absence. A student who fails to register for two consecutive sessions without permission, automatically loses his/her admission on this basis.
Transfer Cases
The Course Credit System permits inter Departmental and inter faculty transfers. For this to be possible however, the candidate must satisfy the requirements of the intended Department or Faculty.

Notification of Results
After the Faculty Board has decided on the recommendations to be made to Senate, the Dean may publish them to the students as provisional examination results subject to Senate approval. The Head of Department may notify the students of the letter grades and CGPA they had obtained. Formal transcripts of examination results may only be issued on request by the student on payment of the prescribed fee to the University. Certificates of the award of degrees approved by the Senate shall be issued to successful graduates.

Discipline
The Examination regulations set out on page 9 bind all students, the breach of which carries serious punishments prescribed below:

Expulsion from the University
The following offences shall carry the punishment of expulsion.
  a. Impersonation at examinations. This may involve exchange of examination number, name/answer sheets or the intentional use of someone else's examination number.
  b. Exchange of relevant materials in examination hall which may involve: The exchange of question paper containing relevant jottings and materials collaboration/copying from each other.
  c. Exchange of answer scripts.

Rustication for one Academic Year
The following offences shall carry the punishment of rustication for one academic session.
  a. Non-submission or incomplete submission of answer scripts.
  b. Introduction of foreign materials to the examination hall.
Written Warning
The following offences shall attract a written warning:
   a. Speaking/conversation during examination.
   b. Writing on question papers/scripts.
Details on examination rules and regulations may be obtained from the University Calendar published by Academic Planning and Monitoring Unit.

Computer Laboratories
The Department has five Computer laboratories available for conducting practicals for Computer Science Students, Mathematics Students and Statistics Students.

The laboratories are well-equipped with 125 computers. The laboratories are networked using Star topology via two twelve port switches. The Department is fully connected to the Internet through wired and wireless connections. There are six graduate assistants available in the laboratories coordinating along with assistant laboratory coordinator who is responsible for the overall lab management. The laboratory coordinator is always available throughout the working hours for any problem encountered by students. Each laboratory is taken care of by a senior laboratory operator. The operator can also be contacted for any problem.

Software related to Windows programming, Internet programming, Web design, graphic and animation design are installed on specific machines. There are both Windows XP and Fedora Core 2 operating system environments available on these computers. There are also the following software packages used by Mathematics students and Statistics students; SPSS, STATISTICA, Graphica, MINITAB, MATLAB and EXCEL, etc.

Enquiries
Enquiries from students could be routed through their Level Coordinator to the Head of the Department. Enquires from all other quarters should be addressed to the Head of Department.