# MAHATMA GANDHI UNIVERSITY

# KOTTAYAM

# B.VOC. DEGREE PROGRAMME IN

# SOFTWARE DEVELOPMENT AND SYSTEM ADMINISTRATION

# REGULATION, SCHEME AND SYLLABUS

# (2018 ADMISSION ONWARDS)

# REGULATION AND SCHEME FOR B.VOC. PROGRAMME UNDER MAHATMA GANDHI UNIVERSITY

(2018 admissions onwards)

We are facing unprecedented challenges – Skill and knowledge, the driving forces of economic growth and social development for any country. Presently, the country faces a demand – supply mismatch, as the economy needs more 'skilled' workforce than that is available. In the higher education sphere, knowledge and skills are required for diverse forms of employment in the sector of education, health care manufacturing and other services. Potentially, the target group for skill development comprises all those in the labour force, including those entering the labour market for the first time, those employed in the organized sector and also those working in the unorganized sector. Government of India, taking note of the requirement for skill development among students launched National Vocational Education Qualification Framework (NVEQF) which was later on assimilated into National Skills Qualifications Framework (NSQF). Various Sector Skill Councils (SSCs) are developing Qualification Packs (QPs), National Occupational Standards (NOSs) and assessment mechanisms in their respective domains, in alignment with the needs of the industry.

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as a part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma under the NSQF (National skill Qualifications framework). The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs

and creating appropriate knowledge. The proposed vocational programme will be a judicious mix of skills, professional education related to concerned vocation and also appropriate content of general education.

The **Mahatma Gandhi University** gave a strong momentum to the initiatives of UGC-NSQF in the very beginning itself. This University provides opportunities to its affiliating colleges since Academic Year 2014-15 to start skill based vocational Graduate programmes strictly under the guidelines of UGC and NSQF.

## 1.      TITLE

These regulations shall be called "**MAHATMA GANDHI UNIVERSITY REGULATIONS FOR B.VOC PROGRAMME 2018**".

## 2.      SCOPE

Applicable to all regular B.Voc Programme conducted by the University with effect from 2018 admissions onwards, except for B.Voc. Programmes, having scheme and syllabus already approved by MGU under 2014 regulation and scheme.

During the academic year 2018-19 admission onwards, all regular B.Voc Programmes in affiliating colleges under MG University should strictly follow *Mahatma Gandhi University Regulations For B.Voc Programme 2018*.

## 3.      ELIGIBILITY FOR ADMISSION AND RESERVATION OF SEATS

Eligibility for admissions and reservation of seats for various Under graduate Programmes shall be according to the rules framed by the University and UGC in this regard, from time to time.

## 4.      TYPE OF COURSES AND AWARDS:

There will be full time credit-based modular programmes, wherein banking of credits for skill and general education components shall be permitted so as to enable multiple exit and entry.

| NSQF Level ~4 | • **Certificate** (06 Months – 30 Credits after 10+12) |
| NSQF Level - 5 | • **Diploma** (01 Year – 60 Cumulative Credits after 10+2) |
| NSQF Level - 6 | • **Advanced Diploma** (02 Years – 120 Cumulative Credits) |
| NSQF Level -7 | • **B.Voc Degree** (03 Years – 180 Cumulative Credits after 10+2) |
| NSQF Level - 8 | • **P.G. Diploma** (01Years – 60 Credits after B.Voc) |
| NSQF Level –9 | • **M.Voc Degree** (02 Years -120 Credits after B.Voc) |
| NSQF Level -10 | • **Research Level** (*UGC (MINIMUM STANDARDS AND PROCEDURE FOR AWARD OF M.PHIL./PH.D DEGREES) REGULATIONS, 2016* ) |

The multiple entry and exit enables the learner to seek employment after any level of Award and join back as and when feasible to upgrade qualifications / skill competencies either to move higher in the job profile or in the higher educational system. This will also provide the learner an opportunity for vertical mobility to second year of B.Voc degree programme after one year diploma and to third year of B.Voc degree programme after a two year advanced diploma. The students may further move to Masters and Research degree programmes mapped at NSQF Level 8 – 10.

## 5. CURRICULA AND CREDIT SYSTEM FOR SKILL BASED COURSES

In order to make education more relevant and to create 'industry fit' skilled workforce, the institutions recognized under B.Voc Degree programme offering skill based courses will have to be in constant dialogue with the industry and respective Sector Skill Councils (SSC's) so that they remain updated on the requirements of the workforce for the local economy. These institutions should also preserve and promote the cultural heritage of the region, be it art, craft, handicraft, music, architecture or any such thing, through appropriately designed

curriculum leading to gainful employment including self- employment and entrepreneurship development.

The curriculum in each of the semester/years of the programme(s) will be a suitable mix of general education and skill development components. The General Education Component shall have 40% of the total credits and balance 60% credits shall be of Skill Component.

The institution(s) shall prepare draft curriculum as per the UGC guidelines for Curricular Aspects Assessment Criteria and Credit System for Skill based Vocational Courses and place it for vetting by the UGC Advisory Committee constituted under these guidelines.

The Curriculum shall be finally approved by the Board of Studies (BoS) and Academic Council of the University / Autonomous College. The Universities where BoS for Vocational subjects has not yet been constituted, the curriculum may be considered by the BoS in allied subject area or an ad-hoc BoS may be constituted till the time regular BoS is notified in the university. The BoS should consider the programme wise curriculum based QP for skill component and relevant general education subjects *i.e.* the curricula for programmes in one broad subject area may vary from institution to institution in case the different progressive QPs are mapped with the programmes being offered. The choice of different progressive Job roles for a course may also be enabled under CBCS.

## 6. STRUCTURE OF THE PROGRAMME

### 6.1 Skill Development Components - 60% Weightage

### 6.2 General Education Component - 40% Weightage

The B.Voc Programme should comprise 60% Skill Development Components (60% of total Credit) and 40% General Education Component (40% total Credit) as per guidelines of UGC and NSQL.

As an illustration, awards shall be given at each stage as per Table 1 below for cumulative credits awarded to the learners in skill based vocational courses.

**Table-1**

| NSQF Level | Skill Component Credits | General Education Credits | Total Credits for Award | Normal Duration | Exit Points / Awards |
|---|---|---|---|---|---|
| 7 | 108 | 72 | 180 | Six Semesters | B.Voc Degree |
| 6 | 72 | 48 | 120 | Four semesters | Advanced Diploma |
| 5 | 36 | 24 | 60 | Two semesters | Diploma |
| 4 | 18 | 12 | 30 | One semester | Certificate |

## 7. SCHEME AND SYLLABUS

7.1. B.Voc Programme should include (**a**) General Education Component, (**b**) Skill Education Component.

7.2. The B.Voc Programme should followed Credit and Semester System of MGU.

7.3. A separate minimum of 30% marks each for internal and external (for both theory and AOC) and aggregate minimum of 40% are required for a pass for a course. For a pass in a programme, **Grade P** is required for all the individual courses. If a candidate secures **F Grade** for any one of the courses offered in a Semester/Programme, **only F grade** will be awarded for that Semester/ Programme until he/she improves this to **P Grade** or above within the permitted period.

## 8. ASSESSMENT AND EVALUATION BY MG UNIVERSITY.

General Education Components and Skill Development Components shall be assessed and evaluated by MG University as per University Norms and UGC-NSQF guidelines.

## 9. ASSESSMENT AND CERTIFICATION BY SECTOR SKILL COUNCIL(SSC)

The affiliated colleges should make necessary arrangements for the

simultaneous assessments and certification of Skill Development Component by aligned SSC having the approval of National Skill Development Corporation of India (NSDC).

## 10. EXAMINATIONS

**10.1** The evaluation of each paper shall contain two parts:

- Internal or In-Semester Assessment (ISA)

- External or End-Semester Assessment (ESA)

**10.2.** The internal to external assessment ratio shall be 1:4.

Both internal and external marks are to be rounded to the next integer.

All the courses (theory & AOC), grades are given **on a 7-point scale** based on the total percentage of marks, *(ISA+ESA)* as given below:-

*AOC- Activity Oriented Course

| Percentage of Marks | Grade | Grade Point |
|---|---|---|
| 95 and above | O (Outstanding) | 10 |
| 90 to below 95 | A+ (Excellent) | 9 |
| 80 to below 90 | A (Very Good) | 8 |
| 70 to below 80 | B+ (Good) | 7 |
| 60 to below 70 | B (Above Average) | 6 |
| 50 to below 60 | C (Average) | 5 |
| 40 to below 50 | P (Pass) | 4 |
| Below 40 | F(Fail) | 0 |
| | Ab (Absent) | 0 |

## 11. CREDIT POINT AND CREDIT POINT AVERAGE

**Credit Point (CP)** of a paper is calculated using the formula:-

*CP = C × GP, where C is the Credit and GP is the Grade point*

**Semester Grade Point Average (SGPA)** of a Semester is calculated using the formula:-*SGPA = TCP/TC, where TCP is the Total Credit Point of that semester.*

**Cumulative Grade Point Average (CGPA)** is calculated using the formula:-

*CGPA = TCP/TC, where TCP is the Total Credit Point of that programme.*

**Grade Point Average (GPA)** of different category of courses viz. Common Course I, Common Course II, Complementary Course I, Complementary Course II, Vocational course, Core Course is calculated using the formula:-

*GPA        =        TCP/TC, where TCP is the Total Credit Point of a category*

*of course. TC is the total credit of that category of course*

Grades for the different courses, semesters and overall programme are given based  on the corresponding CPA as shown below:

| GPA | Grade | |
|---|---|---|
| 9.5 and above | **O** | **Outstanding** |
| 9 to below 9.5 | **A+** | **Excellent** |
| 8 to below 9 | **A** | **Very Good** |
| 7 to below 8 | **B+** | **Good** |
| 6 to below 7 | **B** | **Above Average** |
| 5 to below 6 | **C** | **Average** |
| 4 to below 5 | **P** | **Pass** |
| Below 4 | **F** | **Fail** |

## 12. MARKS DISTRIBUTION FOR EXTERNAL AND INTERNAL EVALUATIONS

The external theory examination of all semesters shall be conducted by the University at the end of each semester. Internal evaluation is to be done by continuous assessment. For all courses total marks of external examination is 80 and total marks of internal evaluation is 20. Marks distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

### 12.1. For all Theory Courses

**a) Marks of external Examination       :       80**

**b) Marks of internal evaluation       :       20**

| Components of Internal Evaluation – Theory | Marks |
|---|---|
| Attendance | 5 |
| Assignment /Seminar/Viva | 5 |
| Test paper(s) (1 or 2) ($1\times10 =10$;  $2\times5 =10$) | 10 |
| Total | 20 |

For all AOC Courses total marks for external evaluation is 80 and total marks for internal evaluation is 20.

### 12.2    For all Activity Oriented Courses (AOC)

**a) Marks of external Examination                    :       80**

**b) Marks of internal evaluation                    :       20**

| Components of Internal Evaluation – AOC | Marks |
|---|---|
| Attendance | 5 |
| Record | 5 |
| Skill Test | 5 |
| Lab Performance / Punctuality | 5 |
| Total | 20 |

*Marks awarded for Record should be related to number of experiments recorded and duly signed by the teacher concerned in charge. All three components of internal assessments are mandatory.

## 12.3 PROJECT EVALUATION

a) **Marks of external Examination** : **80**

b) **Marks of internal evaluation** : **20**

| Components of Internal Evaluation | Marks |
|---|---|
| Punctuality | 5 |
| Experimentation/Data Collection | 5 |
| Skill Acquired | 5 |
| Report | 5 |
| **Total** | **20** |

**\***Marks for dissertation may include study tour report if proposed in the syllabus.

| Components of External Evaluation | Marks |
|---|---|
| Dissertation (External) | 50 |
| Viva-Voce (External) | 30 |
| **Total** | **80** |

(Decimals are to be rounded to the next higher whole number)

## 13. INTERNSHIP

After the completion of every even semester, the student will undergo a minimum of two weeks Internship 14Programme in an Industry, having a good exposure in the concerned skill (Established at least two years prior), capable of delivering the skill sets to the students. At the end of the Internship, the students should prepare a comprehensive report.

## 14. ATTENDANCE EVALUATION FOR ALL PAPERS

| Attendance Percentage | Marks |
|---|---|
| Less than 75 % | 1 Mark |
| 75 % & less than 80% | 2 Marks |
| 80% & less than 85% | 3 Marks |
| 85% & less than 90% | 4 Marks |
| 90% & above | 5 Marks |

(Decimals are to be rounded to the next higher whole number)

## 15. ASSIGNMENTS

Assignments are to be done from 1st to 4th Semesters. At least one assignment per course per semester should be submitted for evaluation.

## 16. INTERNAL ASSESSMENT TEST PAPERS

Two test papers are to be conducted in each semester for each course. The

evaluations of all components are to be published and are to be acknowledged by the candidates. All documents of internal assessments are to be kept in the college for one year and shall be made available for verification by the University. The responsibility of evaluating the internal assessment is vested on the teacher(s), who teach the course.

## 17. GRIEVANCE REDRESSAL MECHANISM

Internal assessment shall not be used as a tool for personal or other type of vengeance. A student has all rights to know, how the teacher arrived at the marks. In order to address the grievance of students, a three-level Grievance Redressal mechanism is envisaged. A student can approach the upper level only if grievance is not addressed at the lower level.

### 17.1 Level 1: Department Level:

The Department cell chaired by the HOD, Department Coordinator, Faculty Advisor and Teacher in-charge as members.

### 17.2 Level 2: College level

A committee with the Principal as Chairman, College Coordinator, HOD of concerned Department and Department Coordinator as members.

### 17.3 Level 3: University Level

A Committee constituted by the Vice-Chancellor as Chairman, Pro-Vice-Chancellor, Convener - Syndicate Standing Committee on Students Discipline and Welfare, Chairman-Board of Examinations as members and the Controller of Examination as member-secretary.

The College Council shall nominate a Senior Teacher as coordinator of internal evaluations. This coordinator shall make arrangements for giving awareness of the internal evaluation components to students immediately after commencement of first semester

The internal evaluation marks/grades in the prescribed format should reach the University before the 4th week of October and March in every academic year.

## 18. EXTERNAL EXAMINATION

The external examination of all semesters shall be conducted by the University at the end of each semester.

●Students having a minimum of 75% average attendance for all the courses only can register for the examination. Condonation of shortage of attendance to a maximum of 10 days in a semester subject to a maximum of 2 times during the whole period of the programme may be granted by the University on valid grounds.

This condonation shall not be counted for internal assessment. Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as presentforthe days of absence, on production of participation/attendance certificates, within oneweek, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also. Those students who are not eligible even with condonation of shortage of attendance shall repeat the **semester** along with the next batch after obtaining readmission.

● Benefit of attendance may be granted to students attending University/College union/Co-curricular activities by treating them as present for the days of absence, on production of participation/attendance certificates, within one week, from competent authorities and endorsed by the Head of the institution. This is limited to a maximum of 10 days per semester and this benefit shall be considered for internal assessment also.

● Those students who are not eligible even with condonation of shortage of attendance shall repeat the course along with the next batch.

● There will be no supplementary exams. For reappearance/ improvement, the students can appear along with the next batch.

● Student who registers his/her name for the external exam for a semester

will be eligible for promotion to the next semester.

- A student who has completed the entire curriculum requirement, but could not register for the Semester examination can register notionally, for getting eligibility for promotion to the next semester.

- A candidate who has not secured minimum marks/credits in internal examinations can re-do the same registering along with the University examination for the same semester, subsequently.

## 19. PATTERN OF QUESTIONS

Questions shall be set to assess knowledge acquired, standard and application of knowledge, application of knowledge in new situations, critical evaluation of knowledge and the ability to synthesize knowledge. The question setter shall ensure that questions covering all skills are set. She/he shall also submit a detailed scheme of evaluation along with the question paper. A question paper shall be a judicious mix of short answer type, short essay type /problem solving type and long essay type questions.

### 19.1 Pattern of questions for External examination – Theory paper

| Question Type | Total no. of questions | Number of questions to be answered | Marks of each question | Total marks |
|---|---|---|---|---|
| Very short answer type | 12 | 10 | 2 | 20 |
| Short answer (Not to exceed 60 words) | 9 | 6 | 5 | 30 |
| Long essay | 4 | 2 | 15 | 30 |
| **TOTAL** | **25** | **18** | | **80** |

**19.2    Pattern of questions for external examination –AOC**

| Question Type | Total no. of questions | Number of questions to be answered | Marks of each question | Total marks |
|---|---|---|---|---|
| Theory Assessment- Short Answer Type | 8 | 5 | 4 | 20 |
| Skill Assessment- Practical | 1 | 1 | 60 | 60 |
| **TOTAL** | **9** | **6** | | **80** |

**19.3    Mark division for external AOC/ LAB examination**

| Record | Theory/ Procedure/ Design | Activity/ Neatness | Result | Viva | Total |
|---|---|---|---|---|---|
| 10 | 10 | 20 | 10 | 10 | 60 |

## 20.    RANK CERTIFICATE

The University publishes rank list of top 10 candidates for each programme after the publication of $6^{th}$ semester results. Rank certificate shall be issued to candidates who secure positions from $1^{st}$ to $3^{rd}$ in the rank list. Candidates who secure positions from fourth to tenth in the rank list shall be issued position certificate indicating their position in the rank list.

Candidates shall be ranked in the order of merit based on the CGPA scored by them. Grace marks awarded to the students should not be counted fixing the rank/position. Rank certificate and position certificate shall be signed by the Controller of Examinations.

### 21. MARK CUM GRADE CARD

The University shall issue to the student grade/marks card (by online) on completion of each semester, which shall contain the following information:

- Name of University
- Name of the College
- Title & Model of the B. VOC Programme
- Semester concerned
- Name and Register Number of students
- Code, Title, Credits and Max. Marks (Int, Ext & Total) of each course opted in the semester
- Internal marks, External marks, total marks, Grade, Grade point (G) and Credit point in each course in the semester
- Institutional average of the Internal Exam and University Average of the External Exam in each course.
- The total credits, total marks (Max & Awarded) and total credit points in the semester (corrected to two decimal places)
- Semester Credit Point Average (SCPA) and corresponding Grade
- Cumulative Credit Point Average (CCPA)

The final Grade/mark Card issued at the end of the final semester shall contain the details of all courses taken during the entire programme and shall include the final grade/marks scored by the candidate from $I^{st}$ to $5^{th}$ semester, and overall grade/marks for the total programme.

### 22. READMISSION

Readmission will be allowed as per the prevailing rules and regulations of the university. There shall **be 3 level monitoring** committees for the successful conduct of the scheme. They are:

1. Department Level Monitoring Committee (DLMC), comprising HOD

and two senior-most teachers as members.

2. College Level Monitoring Committee (CLMC), comprising Principal, Dept. – Co- Ordinator and A.O/Superintendent as members.

3. University Level Monitoring Committee (ULMC), headed by the Vice – Chancellor and Pro–Vice – Chancellor, Conveners of Syndicate subcommittees on Examination, Academic Affairs and Staff and Registrar as members and the Controller of Examinations as member-secretary.

## 23. TRANSITORY PROVISION

Notwithstanding anything contained in these regulations, the Vice Chancellor shall, for a period of one year from the date of coming into force of these regulations shall be applied to any programme with such modifications as may be necessary.

# SCHEME AND SYLLABUS FOR B.VOC SOFTWARE DEVELOPMENT AND SYSTEM ADMINISTRATION

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma under the NSQF (National skill Qualifications framework). The B.Voc. The programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge.

The proposed vocational programme in Software Development and System Administration will be a judicious mix of skills, professional education related to Web application development, UI development, Mobile app development, system administration, Entrepreneurship development and also appropriate content of general education. It is designed with the objective of equipping the students to cope with the emerging trends and challenges in the field of software development and system administration.

## 24. OBJECTIVE

- To provide judicious mix of skills relating to a profession and appropriate content of general education.

- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.

- To provide flexibility to students by means of pre-defined entry and multiple exit points.

- To integrate NSQF within the undergraduate level of higher education in

order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.

- To provide vertical mobility to students coming out of:
  - ➢     10+2 with vocational subjects
  - ➢     Community Colleges.

## 25. ELIGIBILITY FOR ADMISSION AND RESERVATION OF SEATS

The eligibility for admission to B.voc programme shall be Plus Two or its equivalent with Mathematics/Computer Science as one of the subjects. Eligibility of admission, Norms for admission, reservation of seats for various B.Voc Programmes shall be according to the rules framed by the University from time to time.

## 26. CURRICULUM

The curriculum in each of the years of the programme would be a suitable mix of general education and skill development components.

## 27. PROGRAMME STRUCTURE

The B.Voc Software Development and System Administration shall include:

- ❖ General Education Components
- ❖ Skill Components
- ❖ Project
- ❖ Internship
- ❖ Industrial Training
- ❖ Familiarization Trips
- ❖ Soft Skills and Personality Development Programmes

## 28. CREDIT CALCULATION

The following formula is used for conversion of time into credit hours.

- ❖ One Credit would mean equivalent of 15 periods of 60 minutes each, for

theory, workshops/labs and tutorials;

❖ For internship/field work, the credit weightage for equivalent hours shall be 50% of that for lectures/workshops;

## 29. COURSE STRUCTURE

| NSQF Level | Skill Component Credits | General Education Credits | Normal calendar duration | Exit Points / Awards |
|---|---|---|---|---|
| Level 7 | 36 | 24 | Six Semesters | B.Voc. |
| Level 6 | 36 | 24 | Four semesters | Advanced Diploma |
| Level 5 | 18 | 12 | Two semesters | Diploma |
| Level 4 | 18 | 12 | One Semester | Certificate |
| TOTAL | 108 | 72 | | |

As per the UGC guidelines, there are multiple exit point for a candidate admitted in this course. If he/she is completing all the six semesters successfully, he/she will get B.Voc. degree in Software Development and System Administration. If he/she is completing the first four semesters successfully, he/she will get an advanced diploma in Software Development and System Administration. If he/she is completing the first two semesters he/she will get a diploma in Software Development and System Administration. B.Voc. Degree holder is expected to acquire the skills needed for Web Developer, UI Developer, System Integrator, Desktop/Web Application Developer, Database Administrator, Mobile App developer, Java Developer, and Master Trainer for Junior Software Developer.

## PROGRAMME STRUCTURE

### Semester – I

| Sl. No. | Course Code | Title | GC/SC | Hrs./Week | Credits |
|---|---|---|---|---|---|
| 1 | BOCG101 | Listening and Speaking Skills in English(T) | GC | 4 | 4 |
| 2 | BOCG102 | IT For Business (AOC) | GC | 3 | 4 |
| 3 | SDSG103 | Discrete Mathematics (I) (T) | GC | 3 | 4 |
| 4 | SDSS104 | The Methodology of Programming and Programming in C(AOC) | SC | 5 | 6 |
| 5 | SDSS105 | Web Technology and Internet Programming (AOC) | SC | 5 | 6 |
| 6 | SDSS106 | Project- I | SC | 5 | 6 |

### Semester – II

| Sl. No. | Course Code | Title | GC/SC | Hrs./Week | Credits |
|---|---|---|---|---|---|
| 1 | BOCG201 | Writing and Presentation Skills in English (T) | GC | 4 | 4 |
| 2 | SDSG202 | Discrete Mathematics (II) (T) | GC | 4 | 4 |
| 3 | SDSG203 | Object Oriented Programming Using C++ (AOC) | GC | 5 | 4 |
| 4 | SDSS204 | Programming in PHP(AOC) | SC | 6 | 6 |
| 5 | SDSS205 | DBMS & MySQL (AOC) | SC | 6 | 6 |
| 6 | SDSS206 | Internship-I | SC |  | 6 |

### Semester – III

| Sl. No. | Course Code | Title | GC/SC | Hrs./Week | Credits |
|---|---|---|---|---|---|
| 1 | BOCG301 | Principles of Management(T) | GC | 4 | 4 |
| 2 | SDSG302 | Computer Organization and Architecture (T) | GC | 3 | 4 |
| 3 | SDSG303 | Data structures using C++ (AOC) | GC | 3 | 4 |
| 4 | SDSS304 | Desktop Applications Development in .Net Framework | SC | 5 | 6 |

| Sl. No. | Course Code | Title | GC/SC | Hrs./Week | Credits |
|---|---|---|---|---|---|
| | | (AOC) | | | |
| 5 | SDSS305 | SQL Server 2016: Administration (AOC) | SC | 5 | 6 |
| 6 | SDSS306 | Project- II | SC | 5 | 6 |

**Semester – IV**

| Sl. No. | Course Code | Title | GC/SC | Hrs./Week | Credits |
|---|---|---|---|---|---|
| 1 | BOCG401 | Soft Skills and Personality Development (T) | GC | 4 | 4 |
| 2 | SDSG402 | System Analysis & Software engineering (T) | GC | 4 | 4 |
| 3 | SDSG403 | Operating Systems (AOC) | GC | 5 | 4 |
| 4 | SDSS404 | ASP .NET MVC Applications (AOC) | SC | 6 | 6 |
| 5 | SDSS405 | Node.js (AOC) | SC | 6 | 6 |
| 6 | SDSS406 | Internship-II | SC | | 6 |

**Semester – V**

| Sl. No. | Course Code | Title | GC/SC | Hrs./Week | Credits |
|---|---|---|---|---|---|
| 1 | BOCG501 | Environmental Studies (T) | GC | 4 | 4 |
| 2 | SDSG502 | Software Testing and Quality Controls(T) | GC | 3 | 4 |
| 3 | SDSG503 | Computer Networks (T) | GC | 3 | 4 |
| 4 | SDSS504 | Cloud Computing (T) | SC | 5 | 6 |
| 5 | SDSS505 | Core Java (AOC) | SC | 5 | 6 |
| 6 | SDSS506 | Project- III | SC | 5 | 6 |

**Semester – VI**

| Sl. No. | Course Code | Title | GC/SC | Hrs./Week | Credits |
|---|---|---|---|---|---|
| 1 | BOCG601 | Entrepreneurship Development(T) | GC | 4 | 4 |
| 2 | SDSG602 | Informatics & Cyber Ethics (T) | GC | 4 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| 3 | SDSG603 | Data warehousing and Big Data Analytics (T) | GC | 5 | 4 |
| 4 | SDSS604 | Artificial Intelligence (T) | SC | 6 | 6 |
| 5 | SDSS605 | Mobile Applications Development (AOC) | SC | 6 | 6 |
| 6 | SDSS606 | Internship-III | SC | | 6 |

*GC- General Component

*SC – Skill Component

# JOB ROLES

## YEAR I (NSQF Level: 5)

After completion of first year students can work as Web Application Developer, UI Developer, or System Integrator.

1st Year Syllabus is aligned with NSQF Qualification Pack: Web Developer.

## YEAR I (NSQF Level: 6)

After completion of 2nd year the students can work as Desktop/Web Application Developer, Database Administrator, or Linux Administrator.

2nd Year syllabus is designed to meet the National Occupational Standards for NSQF Qualification Pack: Master Trainer for Junior Software Developer.

## YEAR I (NSQF Level: 7)

After completion of 3rd year the students can start their own business or work as Mobile App developer, Cloud Administrator, or Java Developer.

Syllabus is designed to meet the National Occupational Standards for NSQF Qualification Pack: Software Developer

# B.VOC. SOFTWARE DEVELOPMENT AND SYSTEM ADMINISTRATION

## DETAILED SYLLABUS

## SEMESTER – I

## BOCG101 LISTENING AND SPEAKING SKILLS IN ENGLISH

*Objectives: To introduce the students to the speech sounds of English in order to enable them to listen to English and speak with global intelligibility. To enable the students to speak English confidently and effectively in a wide variety of situations. To help the students to improve their reading efficiency by refining their reading strategies.*

### MODULE – I

**Speech Sounds:** Phonemic symbols – Vowels – Consonants – Syllables – Word stress – Stress in polysyllabic words – Stress in words used as different parts of speech – Sentence stress –Weak forms and strong forms – Intonation

### Sample activities:

1- *Practice reading aloud. Use a variety of texts including short stories, advertisement matter, brochures, etc*

2- *Read out a passage and ask the students to identify the stressed and unstressed syllables.*

### MODULE – II

**Basic Grammar:** Articles - Nouns and prepositions - Subject-verb agreement - Phrasal verbs - Modals - Tenses - Conditionals – Prefixes and suffixes – Prepositions -Adverbs – Relative pronouns - Passives - Conjunctions - Embedded questions - Punctuation –Abbreviations- concord- collocations-phrasal verbs-idiomatic phrases

### Sample activities:

1- *Ask students to write a story/report/brochure, paying attention to the grammar.*

### MODULE – III

**Listening:** Active listening – Barriers to listening – Listening and note taking – Listening to announcements – Listening to news on the radio and television.

### Sample activities:

1- *Information gap activities (e.g. listen to a song and fill in the blanks in the lyrics*

*given on a sheet)*

2- *Listen to BBC news/ a play (without visuals) and ask the students to report what they heard.*

## MODULE– IV

Speaking- Fluency and pace of delivery – Art of small talk – Participating in conversations – Making a short formal speech – Describing people, place, events and things – Group discussion skills, interview skills and telephone skills.

**Sample activities:**

1- *Conduct group discussion on issues on contemporary relevance.*

2- *Ask students to go around the campus and talk to people in the canteen, labs, other departments etc. and make new acquaintances.*

3- *Conduct mock interviews in class.*

4- *Record real telephone conversations between students and ask them to listen to the recordings and make the corrections, if any are required.*

## MODULE – V

**Reading:** Theory and Practice – Scanning – Surveying a textbook using an index – reading with a purpose – Making predictions – Understanding text structure – Locating main points –

Making inferences – Reading graphics – Reading critically – Reading for research.

**Books for Reference:**

1- V.Sasikumar, P KiranmaiDutt and GeethaRajeevan, .*Communication Skills in English*.Cambridge University Press and Mahatma Gandhi University.

2- Marilyn Anderson, Pramod K Nayar and Madhucchandra Sen. *Critical Thinking, Academic Writing and Presentation Skills*. Pearson Education and Mahatma Gandhi University.

**For Further Activities**

1. *A Course in Listening and Speaking I & II,* Sasikumar, V.,KiranmaiDutt and Geetha Rajeevan, New Delhi: CUP, 2007

2. *Study Listening: A Course in Listening to Lectures and Note-taking* Tony

Lynch New Delhi: CUP,2007.

3. *Study Speaking: A Course in Spoken English for Academic Purposes.*

Anderson, Kenneth, Joan New Delhi: OUP, 2008

## SEMESTER – I

## BOCG102 IT FOR BUSINESS

*Objectives: The objective of the course is to help the student understand and appreciate the critical role of Information Systems in today's organizations*

### MODULE – I

**Introduction to Information Technology:** Information and Communication Technology (ICT), Information systems E-World - Computer Architecture: Input Hardware - Processing &amp; Memory Hardware, Storage Hardware, Output Hardware, Communication Hardware - Concept of operating system - Understanding your computer customization configuring screen, mouse, printer.

### MODULE – II

**Word Processing Package:** Introduction - Features - Word User Interface Elements; Creating new Documents; Basic Editing, Saving a Document; Printing a Document; Print Preview, Page Orientation - Viewing Documents; Setting tabs - Page Margins; Indents; Ruler, Formatting Techniques; Font Formatting, Paragraph Formatting; Page Setup; Headers &amp; Footers; Bullets and Numbered List; Borders and Shading; Find and Replace; Page Break &amp; Page Numbers; Mail Merging-Spelling and Grammar Checking; Tables; Formatting Tables;

### MODULE – III

**Spreadsheet Package:** Introduction, Excel User Interface, working with cell and cell addresses, selecting a Range, Moving, Cutting, Copying with Paste, Inserting and Deleting cells, freezing cells, Adding, Deleting and Copying Worksheet within a workbook, Renaming a Worksheet. Cell Formatting Options, formatting fonts, Aligning, Wrapping and Rotating text, Using Borders, Boxes and Colors, Centering a heading, Changing row/column height/width, Formatting a Worksheet Automatically, Insert Comments, Clear contents in a cell. Using print Preview, Margin and Orientation, Centering a Worksheet, Using header and footer.

### MODULE – IV

**Advanced Features of Spreadsheet Package:** All Functions in Excel, Using Logical Functions, Statistical functions, Mathematical etc. Elements of Excel Charts, Categories, Create a Chart, Choosing chart type, Edit chart axis - Titles, Labels, Data series and legend, Adding a text box, Rotate text in a chart, Saving a chart.

## MODULE –V

**Presentation Package:** Ms-PowerPoint: Advantages of Presentation Screen layout creating presentation inserting slides adding sounds &amp; videos-formatting slides - slide layout views in presentation -slide transition Custom animation Managing slide shows - using pen Setting slide intervals

## Books for Reference:

1. Antony Thomas, Information Technology for Office. Pratibha Publications Gini Courter & Annette Marquis. MS Office 2007: BPBP Publication.

## SEMESTER I
### SDSG103: DISCRETE MATHEMATICS (I)

*Objectives: To explore the fundamental concepts of Mathematics.*

### Module 1: Logic

Propositional Logic, Propositional Equivalence, Predicates and Quantifiers and Rules of Inference
Chapter 1 (Sections 1.1, 1.2, 1.3 and 1.5only)

### Module II: Basic Structures
Sets, Set Operations, Functions, Sequences and Summations
Chapter 2 (Sections 2.1, 2.2, 2.3 and 2.4)

### Module III: Number Theory and Cryptosystem
The Integers and Division, Primes and Greatest Common Divisors, Applications of Number Theory.
Chapter 3 (Sections 3.4, 3.5 and 3.7 Only)

### Module IV: Relations
Relations and Their Properties, Representing Relations, Equivalence Relations, Partial Orderings.
Chapter 7 (Sections 7.1, 7.3, 7.5 and 7.6)

*Text Books:*

1. Kenneth H Rosen ; Discrete Mathematics And Its Applications ; 6th Edition ;

Tata McGraw-Hill Publishing Company Limited

*References :*
1. Clifford Stien, Robert L Drysdale, Kenneth Bogart ; Discrete Mathematics for
   Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd
2. Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education;
   Dorling Kindersley India Pvt.Ltd
3. Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ;
   Pearson Education; Dorling Kindersley India Pvt. Ltd
4. Richard Johnson baugh; Discrete Mathematics; Pearson Education; Dorling
   Kindersley India Pvt.Ltd
5. Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A
   Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd

# SEMESTER I

## SDSS104: THE METHODOLOGY OF PROGRAMMING AND PROGRAMMING IN C

### MODULE I

Introduction to programming, Classification of computer languages, Language translators (Assembler, Compiler, Interpreter), Linker, Characteristics of a good programming language, Factors for selecting a language, Subprogram, Purpose of program planning, Algorithm, Flowchart, Pseudo code, Control structures (sequence, selection, Iteration), Testing and debugging.

### MODULE II

C Character Set, Delimiters, Types of Tokens, C Keywords, Identifiers, Constants, Variables, Rules for defining variables, Data types, C data types, Declaring and initialization of variables, Type modifiers, Type conversion, Operators and Expressions- Properties of operators, Priority of operators, Comma and conditional operator, Arithmetic operators, Relational operators, Assignment operators and expressions, Logical Operators, Bitwise operators.

### MODULE III

Input and Output in C – Formatted functions, unformatted functions, commonly used library functions, Decision Statements If, if-else, nested if-else, if-else-if ladder, break, continue, goto, switch, nested switch, switch case and nested if. Loop control- for loops, nested for loops, while loops, do while loop.

### MODULE IV

Array, initialization, array terminology, characteristics of an array, one dimensional array and operations, two dimensional arrays and operations. Strings and standard functions, Pointers, Features of Pointer, Pointer and address, Pointer declaration, void wild constant pointers, Arithmetic operations with pointers, pointer and arrays, pointers and two-dimensional arrays.

### MODULE V

Basics of a function, function definition, return statement, Types of functions, call by value and reference. Recursion -Types of recursion, Rules for recursive function, direct and indirect recursion, recursion vs iterations, Advantages and disadvantages of recursion. Storage class, Structure and union, Features of

structures, Declaration and initialization of structures, array of structures, Pointer to structure, structure and functions, typedef , bit fields , enumerated data types, Union, Dynamic memory allocation, memory models, memory allocation functions.

*Book of Study:*

1. Ashok Kamthane - Programming in C, Third Edition, Pearson Education

2. P K Sinha&PritiSinha - Computer Fundamentals , Fourth Edition, BPB Publications.

*Reference Text :*

1. E. Balaguruswamy -Programming in ANSI C ,Seventh Edition , McGraw Hill Education

2. Byron Gotfried - Programming with C, Second Edition, Schaums Outline series. McGraw Hill

**SEMESTER- I**

**SDSS105: WEB TECHNOLOGY AND INTERNET PROGRAMMING**

### MODULE I

The Internet, TCP/IP, IP Addressing, Client Server Communication, Intranet, WWW, Web Browser and Web Server, Hyperlinks, URLs.

### MODULE II

HTML5: The structure of HTML program, HTML tags – Text formatting, Text styles, Lists, Adding graphics to HTML documents, Tables, Linking document, iframes, HTML5 new semantic and structural elements, HTML Forms.

### MODULE-III

CSS3: Style Sheets, ID Selectors, Class Selectors, Sizing and the Box model, Positioning in CSS, Display in CSS, Float in CSS.

### MODULE–IV

Javascript: Basic data types; control structures; standard functions; arrays and objects, event driven programming in Javascript; Example Applications;

### MODULE -V

Introduction to jQuery, jQuery basics, jQuery selectors working with events, querying the document, modifying the document, networking with jQuery, working with forms.

*Book of Study:*

1. Jon Duckett,-Web Design with HTML, CSS, JavaScript and jQuery Set 1st Edition, Wiley; 1 edition (July 8, 2014).

2. Laura Lemay, Rafe Colburn, Jennifer Kyrnin - Mastering HTML, CSS &Javascript Web Publishing,First edition, BPB Publications;.

**SEMESTER-I**

**SDSS106: PROJECT I – A STATIC WEBSITE**

Students must do this project individually. And it should cover HTML, CSS, JAVASCRIPT/ JQuery that the student studied during the first semester of his/ her course.

For this project students should develop a static Website. Project should be worked out through various production stages under the guidance and approval of the supervising faculty/faculties. Students have to complete the project within the given time period, and they should keep all the important paper works (abstract, design etc.) along with them.

Students must submit the finished project along with the required paper works and a comprehensive report, to the Head of the Department, before the day of the project evaluation. The project will be evaluated by the external and internal examiners appointed by the university. Delayed, incomplete submissions will be considered as per the university rules.

# SEMESTER – II
## BOCG201 WRITING AND PRESENTATION SKILLS IN ENGLISH

*Objectives: To make the students aware of the fundamental concepts of critical reasoning and to enable them to read and respond critically, drawing conclusions, generalizing, differentiating fact from opinion and creating their own arguments. To assist the students in developing appropriate and impressive writing styles for various contexts. To help students rectify structural imperfections and to edit what they have written. To equip students for making academic presentations effectively and impressively.*

### MODULE – I

**Letter Writing:** Letters - letters to the editor - resume and covering letters -parts and layout of business letters-business enquiry letters offers, quotation-orders and execution-grievances and redressal-sales letters-follow-up letters-status enquiry-collection letters-preparation of power of attorney for partnership- job application letters-resume-CV-reference and recommendation letters- employment letters.

### MODULE II

**Other types of Academic and business Communication(written):**Seminar papers- project reports

- notices - filling application forms - minutes, agenda-reports-essays.

### MODULE – III

**Presentation Skills:** Soft skills for academic presentations - effective communication skills – structuring the presentation - choosing appropriate medium – flip charts – OHP – Power Point presentation – clarity and brevity - interaction and persuasion.

 *\*Compulsory activity: PowerPoint presentations to be conducted by each student in class

### MODULE IV

**Non-verbal communication**-Body language-Kinesics,Proxemics-Para language

Channels-Barriers-Principles of effective communication

**MODULE V**

Online writing and Netiquette- Writing e-mails- use of language – writing for blogs – social media etiquette- professional networking online (LinkedIn, E-factor etc.)

*Compulsory activity: Each student should create a blog and/or profile in LinkedIn*

**Books for Reference:**

1- Marilyn Anderson, Pramod K Nayar and Madhucchandra Sen. *Critical Thinking, Academic Writing and Presentation Skills*. Pearson Education and Mahatma Gandhi University.

2- Antony Thomas,Business Communication and MIS, Pratibha Publications. Bhatia R.C.Business Communication

3- SaliniAgarwal Essential communication skill. Reddy P.N, and Apopannia, Essentials of Business communication.

Sharma R.C,KRISHNA Mohan, Business Communication and Report writing Leod,M.C.,Management Information system

**SEMESTER-II**

**SDSG202: DISCRETE MATHEMATICS (II)**

**MODULE I:** GRAPHS

Graphs and Graph Models, Graph Terminology and Special types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths.

Text 1 Chapter 8 (Sections 8.1, 8.2, 8.3, 8.4 and 8.5 only)

**MODULE II:** TREES

Introduction to Trees, Application of Trees, Tree Traversal, and Spanning Trees.

Text 1 Chapter 9 (Sections 9.1, 9.2, 9.3 and 9.4 only)

**MODULE III**: BOOLEANALGEBRA

Boolean Function, Representing Boolean Functions and Logic Gates

Text 1 Chapter 10 (Sections 10.1, 10.2 and 10.3 only)

**MODULEIV:** MATRICES

Definitions and examples of Symmetric, Skew-symmetric, Conjugate, Hermitian, Skew hermitian matrices. Rank of Matrix , Determination of rank by Row Canonical form and Normal form , Linear Equations, Solution of non homogenous equations using Augmented matrix and by Cramers Rule , Homogenous Equations, Characteristic Equation, Characteristic roots and Characteristic vectors of matix , Cayley Hamilton theorem and applications.

Text 2. Relevant Sections of Chapters 2, 5 , 10 , 19 and 23 (Proofs of all Theorems in Module IV

are Excluded).

***Text Books:***

1. Kenneth H Rosen ; Discrete Mathematics And Its Applications ; 6$^{th}$ Edition ;Tata  McGraw-Hill Publishing Company Limited

2.  Frank Ayres Jr : Matrices , Schaum's Outline Series , TMH Edition.

*References:*

1. Clifford Stien, Robert L Drysdale, KennethBogart ; Discrete Mathematics for

 Computer Scientists; Pearson Education; Dorling Kindersley India Pvt. Ltd

2. Kenneth A Ross; Charles R.B. Wright ; Discrete Mathematics; Pearson Education; Dorling Kindersley India Pvt.Ltd

3. Ralph P. Grimaldi, B.V.Ramana; Discrete And Combinatorial Mathematics ; Pearson  Education; Dorling Kindersley India Pvt. Ltd

4. Richard Johnsonbaugh; Discrete Mathematics; Pearson Education; Dorling

 Kindersley India Pvt.Ltd

5. Winfried Karl Grassman, Jean-Paul Tremblay; Logic And Discrete Mathematics A Computer Science Perspective ; Pearson Education; Dorling Kindersley India Pvt. Ltd

**SEMESTER-II**

**SDSG203: OBJECT ORIENTED PROGRAMMING USING C++ (AOC)**

## MODULE I

**Principles of Object Oriented Programming, Beginning with C++**
Procedure Oriented Programming-Object Oriented Programming-Basic concepts of object-oriented programming- Benefits of OOP- Applications of OOP-A simple C++program-Structure of C++ program- C++ data types-Symbolic constants- Reference by variables-Operators in C++- Operator precedence- Control structures- Function in C++ - The main function, Function prototyping- Call by reference- Return by reference- Inline function- Default arguments- Function overloading.

## MODULE II

**Classes and Objects :**Specifying a class- Defining member functions- Nesting of member functions - Private member functions - Arrays within a class - Memory allocation for objects-Static data members - Static member functions - Arrays of objects - objects as function arguments -Friendly functions- Returning Objects.

## MODULE III

**Constructers and Destructors, Overloading**
Constructors- Default constructor-Parameterized constructor-Copy constructor-Multiple constructors- Constructors with default arguments- Dynamic constructor-Destructors- Operator overloading- Unary and Binary operator overloading- Overloading using friends- Rules for overloading- Type conversion.

## MODULE IV

**Inheritance:** Inheritance - Defining derived classes-Visibility modes-Single, Multilevel, Multiple,
Hierarchical and Hybrid inheritance- Virtual base classes- Abstract classes-Constructors in derived classes- Nesting of classes.

## MODULE V

**Pointers, Virtual Functions and Polymorphism, Working with Files :**Pointers- Pointers to objects this pointer-Pointers to derived classes- Virtual functions- Pure virtual functions- File Stream classes, Opening and closing a file- File opening modes- File pointers and their manipulations- Sequential input and output operations.

***Book of Study:***
**1.** E. Balagurusamy - Object Oriented Programming with C++, Fifth edition, Tata McGraw
Education Hill , 2011.


***Reference****:*
1. Ashok N. Kamthane, Object oriented Programming with ANSI & Turbo C++, First Edition,
Pearson India
2. Robert Lafore, Object Oriented Programming in Turbo C++, First Edition, Galgotia Publications.
3. D Ravichandran, Programming with C++, Second edition, Tata McGraw-Hill.

**SEMESTER II**

**SDSS204: PROGRAMMING IN PHP**

### MODULE I

### Introduction to PHP Fundamentals

Introduction to www, History, Understanding client/server roles, Apache, PHP, MySQL, XAMPP Installation, PHP Basic syntax, PHP data Types, PHP Variables, PHP Constants, PHP Expressions, PHP Operators, PHP Control Structures, PHP Loops.

### MODULE II

### PHP Arrays & Functions

PHP Enumerated Arrays, PHP Associative Arrays, Array Iteration, PHP Multi-Dimensional Arrays, Array Functions, PHP Functions, Syntax, Arguments, Variables, References, Pass by Value & Pass by references, Return Values, Variable Scope, PHP include(), PHP require().

### MODULE III

### PHP Forms, Cookies & Sessions

PHP Form handling, PHP GET, PHP POST, PHP Form Validation, PHP Form Sanitization, PHP Cookie handling, PHP Session Handling, PHP Login Session, Managing user ACL.

### MODULE IV

### PHP Strings Handling

Strings and Patterns, Matching, Extracting, Searching Replacing, Formatting, PCRE

### MODULE V

### Introduction to MySQL

Introduction to MySQL, datatypes, SQL commands-CREATE, UPDATE, INSERT, DELETE, SELECT,PHP functions for MySQL connectivity and operation- mysql_connect, mysql_select_db, mysql_query, mysql_fetch_row, mysql_fetch_array, mysql_result, mysql_list_fields, mysql_num_fields, insertion, updation and deletion of data using PHP, displaying data from MySQL in webpage.

**Book of Study:**

1. Dave W Mercer, Allan Kent, Steven D Nowicki, David Mercer, Dan Squier, Wankyu Choi - Beginning PHP, Wiley Publishing, Inc.
2. Rasmus Lerdorf and Kevin Tatore -Programming PHP, Shroff Publishers & Distributors Pvt. Ltd

**SEMESTER II**

**SDSS205: DBMS & MySQL**

**MODULE-I**

Database Management System Concepts: Introduction, Significance of Database, Database System Applications; Data Independence; Data Modeling for a Database; Entities and their Attributes, Entities, Attributes, Relationships and Relationships Types, Advantages and Disadvantages of Database Management System, DBMS Vs RDBMS. Three Level Architecture of DBMS, Data Definition Language, Data Manipulation Language; Database Management System Structure, Database Manager, Database Administrator, Data Dictionary; Client / Server Architecture.

**MODULE-II**

Data Model and Types of Data Model, Relational Data Model, Hierarchical Model, Network Data Model, Object/Relational Model, Object-Oriented Model; Entity-Relationship Model, Modeling using E-R Diagrams, Notation used in E-R Model, Relationships and Relationship Types; Associative Database Model. File Organization for Conventional DBMS.

**MODULE-III**

An informal look at the relational model; Relational Database Management System; RDBMS Properties, The Entity-Relationship Model; Overview of Relational Query Optimization; System Catalog in a Relational DBMS, Information Stored in the System Catalog, How Catalogs are Stored.

**MODULE-IV**
Categories of SQL Commands; Data Definition; Data Manipulation Statements, SELECT - The Basic Form, Subqueries, Functions, GROUP BY Feature, Updating the Database, Data Definition Facilities. Views; Embedded SQL *, Declaring Variables and Exceptions, Embedding SQL Statements; Transaction Processing, Consistency and Isolation, Atomicity and Durability. Relational Algebra: Basic Operations, Additional Relational Algebraic Operations, Relational Calculus: Tuple Relational Calculus, Semantics of TRC Queries, Examples of TRC Queries; Domain Relational Calculus; Relational ALGEBRA vs Relational CALCULUS.

**MODULE-V**

Normalization: Functional Dependency; Anomalies in a Database; Properties of Normalized Relations; First Normalization; Second Normal Form Relation;

Third Normal Form; Boyce-Codd Normal Form (BNCF); Fourth and Fifth Normal Form. Query processing and Optimization, distributed database, Object oriented database, object related mapping

*Book of Study:*

1. RamezElmasri and ShamkantB.Bavathe - DATABASE SYSTEMS , Sixth Edition, Pearson Education.

*References:*

1. C.J Date- An Introduction to Database Systems, Eighth edition, Pearson Education,2003

2. ReghuRamakrishnan and Johannes Gehrke- Database Management Systems , Third edition, McGraw Hill International Edition.

3. DipinDesai , An Introduction to Database Systems , First Edition, Galgoria Publications .

**SEMESTER II**
**SDSS206: INTERNSHIP – I**

After the completion of the second semester, students will have to undergo a minimum of two weeks internship programme in a reputed IT Company. Students can choose an industry in India or abroad for their internship. College will provide a certificate to prove their identity. A member of the faculty will supervise the student during their internship.

IT Companies having a minimum of two years' after establishment can be chosen.

At the end of the internship, students should prepare a comprehensive report. The report of the work done by the student should be attested by the organization. Student should also produce a certificate of internship from the organization. All the above details should be submitted to the Head of the Department for evaluation.

# SEMESTER – III
## BOCG301 PRINCIPLES OF MANAGEMENT

*Objective: This course is a basic introductory and foundational management course. It is designed for students who desire to equip themselves with key knowledge, skills, and competencies in various aspects of management. The course encompasses the core components of management including planning, organizing, leading and controlling the organizations*

### MODULE – I

**Nature and Process of Management:** Schools of Management Thought – Management Process School, Human Behavioural School, Decision Theory School, Systems Management School, Contingency School – Managerial Role – Basics of Global Management.

### MODULE – II

**Planning:** Objectives – Types of plans - single use plan and repeated plan – MBO, MBE– strategic planning and formulation. Decision making - types and process of decision making – forecasting.

### MODULE – III

**Organising:** Types of organisation - formal and informal, line and staff, functional – organisation structure and design – span of control, delegation and decentralisation of authority and responsibility – organisational culture and group dynamics.

### MODULE – IV

**Staffing:** Recruitment, Selection, Induction, Training, Maintenance and retrenchment Systems approach to HRM – Performance appraisal and career strategy – HRD - meaning and concept.

## MODULE – V

**Directing:** Motivation – meaning - need for motivation. Theories of motivation - Herzberg and McGregor. Leadership- importance – styles of leadership, Managerial Grid by Blake and Mounton, Leadership as a Continuum by Tannenbaum and Schmidt

Path Goal Approach by Robert House (in brief) **Controlling -** Concept, Significance, Methods of establishing control.

### Books for Reference:

1. Moshal.B.S .*Principles of Management,* Ane Books India, New Delhi.
2. Bhatia R.C. *Business Organization and Management*, Ane Books Pvt. Ltd.,New Delhi.
3. Richard Pettinger. *Introduction to Management* , Palgrave Macmillan, New York.
4. **Koontz and O'Donnel.** *Principles of Management ,*Tata McGraw-Hill Publishing Co.Ltd. New Delhi.
5. Terry G.R. *Principles of Management,* D.B.Taraporevala Sons &Co.Pvt.Ltd.,Mumbai.
6. Govindarajan.M and Natarajan S. *Principles of Management*, PHI, New Delhi.
7. Meenakshi Gupta .*Principles of Management*, PHI, New Delhi.

# SEMESTER-III
## SDSG302: COMPUTER ORGANIZATION AND ARCHITECTURE

### MODULE I
Basic computer organization and design Operational concepts, Instruction codes, Computer Registers, Computer Instructions, Memory locations and addresses, Instruction cycle, Timing and control, Bus organization.

### MODULE II
Central Processing Unit: General Register Organization, Stack Organization, Addressing modes, Instruction Classification, Program control.

### MODULE III
Memory Organization Memory Hierarchy, Main Memory, Organization of RAM, SRAM, DRAM, Read Only MemoryROM-PROM,EROM,EEPROM, Auxiliary memory, Cache memory, Virtual Memory, Memory mapping Techniques.

### MODULE IV
Parallel Computer Structures: Introduction to parallel processing, Pipeline computers, Multi processing systems, Architectural classification scheme-SISD, SIMD, MISD, MIMD.

### MODULE V
Pipelining and Vector processing: Introduction to pipelining, Instruction and Arithmetic pipelines (design) Vector processing, Array Processors.

*Book of study :*
1. M.Morris Mano-Computer Systems Architecture, Third Edition, Pearson Education
2. Kai Hwang and F A Briggs-Computer Architecture and parallel processing, McGraw Hills,1990

*Reference :*
1. Carl Hamacher -Computer Organization, Fifth Edition, Tata McGraw Hill.
2. John P Hayes -Computer Architecture & Organization–McGraw Hill
3. William Stallings-Computer Organization and Architecture , Seventh Edition, Pearson Education

**SEMESTER III**

**SDSG303 : DATA STRUCTURES USING C++**

**MODULE I**
Concept of Structured data - Data structure definition, Different types and classification of data structures, Arrays – Memory allocation and implementation of arrays in memory, array operations, Applications - sparse matrix representation and operations, polynomials representation and addition, Concept of search and sort – linear search, binary search, selection sort, insertion sort, quick sort.

**MODULE II**
Stacks – Concepts, organization and operations on stacks using arrays (static), examples, Applications - Conversion of infix to postfix and infix to prefix, postfix evaluation, subprogram calls and execution, Multiple stacks representation. Queues - Concepts, organization and operations on queues, examples. Circular queue – limitations of linear queue, organization and operations on circular queue. Double ended queue, Priority queue.

**MODULE III**
Linked list: Concept of dynamic data structures, linked list, types of linked list, linked list using pointers, insertion and deletion examples, circular linked list, doubly linked lists Applications- linked stacks and queues, memory management basic concepts, garbage collection.

**MODULE IV**
Trees - Concept of recursion, trees, tree terminology, binary trees, representation of binary trees, strictly binary trees, complete binary tree, extended binary trees, creation and operations on binary tree, binary search trees, Creation of binary search tree, tree traversing methods – examples, binary tree representation of expressions.

**MODULE V**
File - Definition, Operations on file (sequential), File organizations - sequential, Indexed sequential, random files, linked organization, inverted files, cellular partitioning, hashing – hash tables, hashing functions, collisions, collision resolving methods.

*Books of study :*

1. G.S Baluja - Data Structures Through C++ (A Practical Approach), Second Edition-2004, DanapatRai& Co.

2. Ellis Horowitz and SartajSahni - Fundamentals of Data Structures in C++ , Second Edition, Galgotia Publications.

*References:*

1. Seymour Lipschutz, Theory and Problems of Data Structures, Schaums Outline Series,2006, McGraw Hill

2. YedidyahLanngsam, Moshe Augustein, Aaron M Tenenbaum- Data structures using C and C++ , Second Edition, Prentice Hall

**SEMESTER III**

**SDSS304: DESKTOP APPLICATIONS DEVELOPMENT IN .NET FRAMEWORK**

**MODULE I**
.NET Framework -The Common Language Runtime , The Framework Class Library, Garbage Collection , MSIL, IntelliSense.
Language Syntax - Basic C# Syntax , Comments, Data Types, Variables , Operators, Conditional Statements ,Looping Structures, Parallel Loops , Functions.

**MODULE II**
Classes & Objects- Classes and Objects, Partial Classes , Methods, Properties and Events , Constructors, Property Procedures , Enumerations , Reference vs. Value types, Structures, Namespaces , Dynamic IL and Dynamic Language Runtime, Abstract Classes and Interfaces, The new Exception Handling in .Net 4.0
Arrays & Collections - Arrays , Resizing Arrays, Array Lists & Hash Tables, Generic Collections.

**MODULE III**
.Net Assembly - Classification of Assembly ,Creating and using Managed DLLs , Private Assembly and Shared Assembly , The Global Assembly Cache .
Windows Forms and Controls, Creating Custom Controls- Create New Controls for Forms, Create a Control from an Existing Control and Add Functionality .
Creating MDI Applications - MDI Applications, MDI Parent and MDI Child Forms, Manage Menus

**MODULE IV**
ADO.NET (Working with Database) - Overview of ADO.NET, Connection Object, Command Object , Data Readers , Data Sets & Data Adapters, Execute non-query, Execute scalar , Execute reader ,Data Grid View Control.
Building Setup Applications - Installation Package , Customize a Setup Project , Control Installation of an Application , Specify Conditions of an Install , Custom Actions for after an Installation.

**MODULE V**
 Exception Handling, Introduction to WCF Development- Service Contract and Implementation , Hosting WCF Services ,WCF Behaviors.
WPF - Introduction toWPF, XAML Browser Application , Working with WPF Controls.
**Book of Study:**

1. "CLR via C#", Jeffrey Richter, Microsoft Press; 4 edition

2. "C# 5.0 in a Nutshell", Ben Albahari, Shroff; Fifth edition.

**SEMESTER III**
**SDSS305: SQL SERVER 2016: ADMINISTRATION**

### MODULE I

Authenticate and authorize users, Assign server and database roles, Authorize users to access resources.

### MODULE II

Protect data with encryption and auditing,  Describe recovery models and backup strategies,

Backup SQL Server databases,  Restore SQL Server databases.

### MODULE III

Configure security for the SQL Server agent, Configuring Credentials, Manage alerts and

notifications, Configuring Database Mail, Operators, Alerts, and Notifications.

### MODULE IV

Trace access to SQL Server, Monitor a SQL Server infrastructure, Capturing and Managing

Performance Data, Analyzing Collected Performance Data.

### MODULE V

Troubleshoot a SQL Server infrastructure, Import and export data , Importing and Exporting

Table Data, Using bcp and BULK INSERT to Import Data, Deploying and Upgrading Data-Tier

Application.

*Book of Study:*

1. "SQL Server 2017 Administration Inside Out 1st Edition", William Assaf Randolph West, Sven Aelterman, Mindy Curnutt, Microsoft Press; 1 edition.

**SEMESTER III**

**SDSS306: PROJECT II - DESKTOP APPLICATIONS DEVELOPMENT IN .NET**

Students must do this project individually. And it should be a desktop application developed in C# and SQL Server. Project should be done under the guidance and approval of the supervising faculty/faculties. Students have to complete the project within the given time period, and they should keep all the important paper works (abstract, design, working principle, data sheet data collection etc.) along with them.

Students must submit the finished project along with the required paper works and a comprehensive report, to the Head of the Department, before the day of the project evaluation. The project will be evaluated by the external and internal examiners appointed by the university. Delayed, incomplete submissions will be considered as per the university rules.

# SEMESTER – IV
## BOCG401 SOFT SKILL AND PERSONALITY DEVELOPMENT

*Objective: The course aims to cause a basic awareness about the significance of soft skills in professional and inter-personal communications and facilitate an all-round development of personality.*

## MODULE – I

**Personal Skills:** Knowing oneself- confidence building- defining strengths- thinking creatively- personal values-time and stress management.

## MODULE – II

**Social Skills:** Appropriate and contextual use of language- non-verbal communication-interpersonal skills- problem solving.

## MODULE – III

**Personality Development:** Personal grooming and business etiquettes, corporate etiquette, social etiquette and telephone etiquette, role play and body language.

## MODULE – IV

**Presentation skills:** Group discussion- mock Group Discussion using video recording - public speaking.

## MODULE – V

**Professional skills:** Organizational skills- team work- business and technical correspondence-job oriented skills-professional etiquettes.

### Books for Reference:
1.    Matila Treece: *Successful communication*: Allyun and Bacon  Pubharkat.
2.    Jon Lisa, *Interatid skills in Tourist Travel Industry,* Longman Group Ltd.
3.    Robert T. Reilly, *Effective communication in tourist travel Industry*    Dilnas Publication.
4.    Boves. *Thill Business Communication Today* Mcycans Hills    Publication.
5.    Dark Studying International Communication Sage Publication.
6.    Murphy Hidderandt Thomas *Effective Business Communication* Mc    Graw Hill.

**SEMESTER IV**
**SDSG402: SYSTEM ANALYSIS & SOFTWARE ENGINEERING**

## MODULE I

Information systems concepts, Business information systems; Describing the business organization – organization chart, organization function list; information system levels - operational, lower, middle, top management; SDLC Life cycle activities- life cycle flow chart, task, management review, baseline specifications, role of system analyst.

## MODULE II

Introduction to Software Engineering - Definition, Program Vs Software, and Software process, Software Characteristics, Brief introduction about product and process, Software process and product matrices. Software life cycle models, Definition, Waterfall model, Increment process models- Iterative, RAD, Evolutionary process models-Prototyping, Spiral. Selection of a life cycle model.

## MODULE III

Software Requirement Analysis and Specification Requirements Engineering type of requirements, Feasibility Studies, Requirement Elicitation – Use Case, DFD, Data Dictionaries, Various steps for requirement analysis, Requirement documentation, Requirement validation, an example to illustrate the various stages in Requirement analysis. Project planning-Size estimation, cost estimation, the constructive cost model (COCOMO).

## MODULE IV

Software Design - Definition, Various types, Objectives and importance of Design phase, Modularity, Strategy of design, Function oriented design, IEEE recommended practice for software design descriptions. Steps to Analyse and Design Objected Oriented System. Software Reliability Definition, McCall software quality model, Capability Maturity Model.

## MODULE V

Software Testing : What is testing?, Test, Test case and Test Suit, Verification and Validation, Alpha, beta and acceptance testing, functional testing, techniques to design test cases, boundary value analysis, Equivalence class testing, decision table based testing, cause effect graphing technique, Structural testing path testing, Graph matrices, Data flow testing; Levels of testing Unit testing, integration testing, system testing, validation testing,

*Book of Study*:
1. Marvin Gore & John Stubbe -Elements Of System Analysis, Fourth Edition, Galgotia Book Source.

2. K K Aggarwal, Yogesh Singh - Software Engineering,Third Edition, New Age International Publications.

*References :*

1. Roger S Pressman - Software Engineering: A Practitioner's Approach, Sixth Edition, McGraw-Hill Higher Education.
1. Ian Sommerville - Software Engineering , Seventh Edition, Pearson Education.
2. Pankaj Jalote - An Integrated approach to Software Engineering, Second Edition, Narosa Publishing

**SEMESTER IV**
**SDSG403: OPERATING SYSTEMS**

## MODULE I

Introduction: OS Definition, Functions, Evolution of OS, OS Structure Operating System Operations, Operating System Services, User Operating System Interface, System Calls, Types of System Calls.

## MODULE II

Process: Basic Concepts, Process Scheduling, Operations on Processes, Inter process communication, Process Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling. Unit

## MODULE III

Process Coordination: Synchronization - The Critical Section problem, Semaphores, Classic Problems of Synchronization, Monitors. Deadlocks: System Model, Deadlock Characterization, Methods of handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

## MODULE IV

Memory Management: Memory Management Strategies - Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual Memory Management- Demand paging, Page Replacement.

## MODULE V

Introduction to Linux OS, The shell, Shell scripts and programming, Linux files and directories.

*Book of study:*

1. Abraham Silberschatz, Peter Galvin and Greg Gagne - Operating System Principles, Seventh Edition, John Wiley
2. William Stallings - Operating Systems, Sixth Edition, Prentice Hall of India, Pearson
3. Richard Petersen – Linux : The Complete Reference,Sixth Edition, Tata McGraw Hill Education Pvt Ltd.

*Reference:*

1. Milan Kovic - Operating Systems, 2ndEdition, (TMH )

**SEMESTER IV**
**SDSS404: ASP.NET MVC APPLICATIONS**

## MODULE I

INTRODUCTION TO MVC:
MVC Architecture, Understand the MVC design pattern and how it's applied in ASP.NET MVC, Understanding Model, Understanding View, Understanding Controller, Key benefits of ASP.NET MVC, Advantages of MVC based Web Application.

## MODULE II
HTML HELPERS:
HTML Helper Methods, Render HTML Form, Using Drop Down List, Binding Html Helper to Model, Using "For" Methods with Typed Model, Creating Views with HTML Helpers.

## MODULE III

EXPLORING CONTROLLER'S :
Exploring Controllers and Controller Base class, Passing data from Controller to View, Comparing View Data, View Bag and Temp Data, Types of Action Methods, Action Method Parameters, Model Binders

## MODULE IV
DESIGNING AND IMPLEMENTING DATABASES WITH SQL SERVER:
Introduction to ADO.NET, Creating Tables and Relationships, SQL Fundamentals, Stored Procedures, Insert, Update, Delete, Select commands

## MODULE V
CREATING AN APPLICATION IN MVC:
Creating strongly-typed views, Understanding URLs and action methods, Using HTML helpers,
Handling form post-backs, Data validation.

*Book of Study:*

1. Adam Freeman -Pro ASP.NET MVC 5, 5th ed. Edition, Apress.
2. Ian Griffiths- Programming C# 5.0, Shroff Publishers & Distributers Pvt. Ltd.

**SEMESTER IV**

**SDSS405: NODE.JS**

**MODULE I**

Understanding the node environment: Extending JavaScript, V8, The process object, The Read-Eval-Print Loop and executing a Node program.

**MODULE II**

Understanding asynchronous event driven programming -Broadcasting events, Listening for events, Timers, Understanding the event loop, Callbacks and errors, Listening for file changes, streaming data across nodes and clients - Exploring streams, Creating an HTTP server, HTTPS, TLS (SSL), and securing your server, The request object, Working with headers.

**MODULE III**

Managing many simultaneous client connections - Understanding concurrency, Routing requests, Handling sessions, Authenticating connections, Creating real -time applications - Introducing AJAX.

**MODULE IV**

Utilizing multiple Processes - Node's single-threaded model, Creating child processes, Communicating with your child, Parsing a file using multiple processes, Real-time activity updates of multiple worker results, View engines – ejs, handlebars, pug .

**MODULE V**

 Express .js, sequelize ,Testing your application - Why testing is important, Native Node testing and debugging tools,.


*Book of Study:*

1. Sandro Pasquali, Kevin Faaborg - Mastering Node.js ,Packt Publishing - ebooks Account; 2nd Revised edition.

**SEMESER IV**

**SDSS406: INTERNSHIP II**

After the completion of the fourth semester, students will have to undergo a minimum of two weeks internship programme in a reputed IT Company to understand various aspects of Software Development and maintenance. Students can choose an industry in India or abroad for their internship. College will provide a certificate to prove their identity. A member of the faculty will supervise the student during their internship. IT companies having a minimum of two years' after establishment can be chosen for the internship programme.

At the end of the internship, students should prepare a comprehensive report. The report of the work done by the student should be attested by the organization. Student should also produce a certificate of internship from the organization. All the above details should be submitted to the Head of the Department for evaluation.

## SEMESTER –V

## BOCG501: ENVIRONMENTAL STUDIES

**AIM**
- To bring in proper awareness among the students on Environmental Issues

**OBJECTIVES**
- To built a pro-environmental attitude and a behavioral pattern in society based on sustainable lifestyles
- To impart basic knowledge on pollution and environmental degradation.

## MODULE 1                                                    (15 hrs)

Introduction to Environment Science: Development and Environment, Human Population and the Environment: Population growth, variation among nations- Population explosion – Case Studies. Sustainable Development – Concept, Policies, Initiatives and Sustainability strategies, Human Development Index, Gandhian Principles on sustainability.

**Natural systems -**Earth –structure, soil formation- factors affecting, soil types, Atmosphere – structure and composition, Hydrosphere – Oceans, rivers, estuaries, Lakes etc., Physical environment of aquatic systems

**Resource utilization and its impacts on environment -**Renewable and non-renewable resources, Forest resources : Use and over-exploitation, Timber extraction, mining, dams and their effects on forest and associated biota.,Water resources : Use and over-utilization of surface and ground water, conflicts over water, River valley projects and their environmental significance- Case studies – Sardar Sarovar, Mineral resources : Use and exploitation, environmental impacts of extraction and use of mineral resources, case studies – sand mining, metal mining, coal mining etc

**Food resources** : World food issues, changes caused by - overgrazing, effects of

modern agriculture, fertilizer-pesticide problems, water logging, and salinity. Case studies Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

**Land resources** : Land as a resource, land degradation, soil erosion and desertification.


## MODULE 2                                                                    (15 hrs)

### Ecosystems

Concept of an ecosystem-Structure and function of an ecosystem-Producers, consumers and decomposers-Energy flow in the ecosystem-Ecological succession-Food chains, food webs and ecological pyramids.

Ecological interactions Types, characteristic features, structure and function of the following ecosystem : Forest, Grassland, Desert, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Significance of wetland ecosystem – Classification, Ecology and Biogeochemistry. Threats and Management


### Biodiversity and its conservation

Introduction – Definition : genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega- diversity nation Hot-spots of biodiversity, Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts., Endangered and endemic species of India, Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. People's participation in biodiversity conservation- Biodiversity Register; Global Climate change and Biodiversity.


## MODULE 3                                                                    (15 hrs)
### Environmental Pollution

Air pollution: sources- mobile, stationary, fugitive; type of pollutants- primary and secondary air pollutants, Smog- classical smog and photochemical smog, Acid rain; Ozone depletion; impacts of air pollutants on environment; control measures.

Water pollution: Sources- Point and non-point sources; Types – chemical, biological and physical; impacts on the environment; water quality – water quality standards;

control measures.

Soil pollution: sources and impacts

Noise pollution: sources, impacts on health, management strategies Thermal pollution and Nuclear pollution - sources and impacts Solid wastes – types, sources, impacts on Environment.

Municipal Solid waste Management: Essential steps- source segregation, collection, Processing and Disposal of residues. Environmental Pollution - case studies
Natural ad anthropogenic Disasters and their management: floods, earthquake, cyclone and landslides.

## MODULE 4                                                    (15 hrs)
## History of environment protection

Silent spring, Ramsar Convention, Stockholm conference, Montreal protocol, Kyoto protocol, earth summit, Rio+10, Rio+20, Brundtland commission Report, Sustainable development Environmental movements in India, Global initiatives for Environmental protection Environmental education –basics ,Tblisi conference, Environment Management Systems Environment Information Systems, Environmental Impact assessment (EIA) – definition and significance, EIA notification; National and state level Authorities; role of public in EIA of a development project

### Social Issues and the Environment

Environmental movements from Unsustainable to Sustainable development-Urban problems related to energy- Water conservation- Rain water harvesting; Watershed management  Environmental ethics : Issues and possible solutions.
Environmental Economics, Green house effect and Climate change Natural and Anthropogenic disasters, Disaster Management ,Wasteland reclamation-Consumerism and waste products- Environmental Laws – General introduction; Major laws in India.Environment Protection Act- Air (Prevention and Control of Pollution) Act-Water (Prevention and control of Pollution) Act-Wildlife Protection Act-Forest Conservation Act-Issues involved in enforcement of environmental legislation-Public awareness

**TEXT BOOK**

*Textbook for Environmental Studies For Undergraduate Courses of all Branches of Higher Education* – Erach Bharucha for University Grants Commission

**Further activities**

- Field work
- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural/ Solid waste dump yards
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

**SEMESTER - V**

**SDSG502: SOFTWARE TESTING AND QUALITY CONTROLS**

*AIM: To provide students the knowledge of testing software*

**MODULE I**

Introduction to Software quality, Background issues, Elements of Software Quality Assurance, SQA task goals & metrics, formal approaches to SQA, Statistical software quality assurance, Software reliability, The ISO 9000 quality standards, the SQA plan.

**MODULE II**

Software testing strategies - Strategic approach to software testing, strategic issues, test strategies for conventional softwares - unit testing & integration testing, test strategies for object oriented software - unit & integration testing in OO context, test strategies for web apps, validation testing, System testing, the art of debugging.

**MODULE III**

Testing Conventional applications - software testing fundamentals, internal & external views of testing, White box testing, Basis path testing, control structure testing, Black box testing, model based testing, testing for specialized environments, architecture& applications, patterns of software testing.

**MODULE IV**

Testing object oriented applications - broadening the view of testing, testing OOA & OOD models, object oriented testing strategies, object oriented testing methods, testing methods applicable at the class level, interclass test-case design.

**MODULE V**

Testing web applications - testing concepts for web apps, the testing process-an overview, content testing, user interface testing, component level testing, navigation testing, configuration testing, security testing, performance testing.

*Book of study*
1. Roger S. Pressman - Software Engineering A Practitioners Approach, Seventh edition, McGraw Hill Education Pvt. Ltd.

*References:*
1. Pankaj Jalote - An Integrated approach to Software Engineering, Second edition, Springer.
2. Baris Beizer - Software Testing techniques, Dreamtech, second edition.
3. Edward Kit - Software Testing in the Real World, Pearson Education of India.
4. K.K.Prasad - Software Testing Tools, Dreamtech.

**SEMESTER V**

## SDSG503: COMPUTER NETWORKS

### MODULE I

Introduction to Networks, Data and signals-analog and digital, periodic analog signals, digital signals, bit rate, baud rate, bandwidth. Transmission impairments- attenuation, distortion and noise. Data communication protocols and standards, Network models - OSI model-layers and their functions. TCP/IP protocol suite.

### MODULE II

Bandwidth utilization Multiplexing: FDM, TDM, spread spectrum. Transmission Media- guided media and unguided media. Switching: message, Circuit and packet switched networks, datagram networks, virtual- circuit networks.

### MODULE III

Data link layer: Error Detection and Correction, Framing, flow and error control, Protocols - Noiseless channels (Simplest, Stop and Wait) and Noisy channels (Stop and Wait and Piggy Backing). Multiple Access Protocols. Random Access-ALOHA, CSMA. Wired LANs-IEEE standards, wireless LANs-Bluetooth, Cellular Telephony

### MODULE IV

Network layer and Transport layer: Repeaters, Bridges, Gateways and routers. Logical addressing – IPV4 and IPV6 addressing, Internet protocol - IPV4 and IPV6. Connectionless and Connection Oriented Services: UDP and TCP. Congestion Control, Quality of Service.

### MODULE V

Application layer: HTTP, FTP, SMTP, DNS. Network security: Common Threats- Firewalls (advantages and disadvantages), Cryptography.

*Book of study:*

1. B. A. Forouzan - Data communication and Networking, Fourth edition-,TMH

2. Andrew S Tanenbaum - Computer Networks ,Fourth Edition, Prentice Hall of India.

**SEMESTER V**

**SDSS504: CLOUD COMPUTING**

### MODULE I
Introduction to Cloud Computing
Historical developments, characteristics of cloud computing, Pros and Cons of cloud computing, Building cloud computing environments, Types of cloud, Parallel vs. Distributed Computing, Virtualization and cloud computing.

### MODULE II
Cloud Computing Architecture
The Cloud Reference Model, Types of Clouds, Open Challenges,

### MODULE III
Cloud platforms in industry
Amazon Web Services-compute services, storage services, communication services, Google AppEngine - architecture and core concepts, application life cycle, Microsoft Azure – Azure core concepts.

### MODULE IV
Cloud Applications
Scientific Applications – health care, geosciences, Business and Consumer Applications – social networking, media applications.
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### MODULE V
Future Trends – future trends of cloud computing, emerging future trends in cloud computing, next generation networking (NGN), next generation services

*Book of study:*
1. RajkumarBuyya, Christian Vecchiola, S ThamaraiSelvi- Mastering Cloud Computing, Tata McGraw Hill Publications.
2. A Srinivasan& J. Suresh " Cloud Computing : A Practical Approach for learning and Implementation " , First edition ,Pearson
*References:*
1. Kumar Saurabha, "Cloud Computing " Wiley Publication Krutz ,Vines "Cloud Security". Wiley Publication.

**SEMESTER V**
**SDSS505: CORE JAVA**

**MODULE I**
Concepts of Object oriented programming, Benefits of OOP, Features of java. Java environment, java tokens, Constant, variables, data types, operators, Control Statements-branching statements, looping statements, jump statements, labeled loops.

**MODULE II**

Defining a Class, Fields declaration, Method declaration, Creating object, Accessing class members, method overloading, Constructors, constructor overloading, super keyword, static Members, Inheritance, overriding methods, dynamic method dispatch, final(variables, methods and classes), abstract methods and classes, interfaces, visibility control.

**MODULE III**
Arrays- One dimensional arrays, declaration, creation, initialization of arrays, two dimensional arrays, String class. Packages: - java API packages overview (lang, util, io, awt, swing, applet), user defined packages-creating packages, using packages Exception Handling Techniques-try-catch-throw-throws-finally -Multithreading- creation of multithreaded program-Thread class-Runnable interface, Thread life cycle.

**MODULE IV**
Event Handling-Delegation Event Model-Event Classes-Sources of Events-Event Listeners-  Event classes- Swing- architecture, components of swing-JLabel, JButton, JCheckBox, JRadioButton, JList, JComboBox, JTextField, JText Area, JPanel, JFrame, Layout Managers(Flow Layout, Grid Layout, Card Layout, Border Layout, Box Layout, Null Layout ).

**MODULE V**
Applet Fundamentals -applet tag, applet life cycle, passing parameters to applets. Working with graphics -Line, Rectangle, Oval, Arc, color setting.JDBC architecture- JDBC connection, JDBC statement object, JDBC drivers.

*Book of study :*
1. E. Balagurusamy- Programming with Java , Third Edition, McGraw Hill Companies.
2. K. Somasundaram - PROGRAMMING IN JAVA2, First Edition, Jaico Publishing House.

*Reference:*

1. Patrick Naughton - Java2 The Complete Reference, Seventh Edition:
2. Cay S Horstmann& Gary Cornell - Core Java Volume 1- Fundamentals,
Eighth edition.
3. Java 6 Programming Black Book 2007 Edition, Dreamtech press.

## SEMESTER V

## SDSS506: PROJECT III – A PROJECT IN CLOUD COMPUTING

Students must do this project individually. And it can cover topics studied up to the fifth semester of his/ her course. Students should do the project in Cloud Computing. Project should be worked out through various stages under the guidance and approval of the supervising faculty/faculties. Students have to complete the project within the given time period, and they should keep all the important paper works (abstract, design etc.) along with them.

Students must submit the finished project along with the required paper works and a comprehensive report, to the Head of the Department, before the day of the project evaluation. The project will be evaluated by the external and internal examiners appointed by the university. Delayed, incomplete submissions will be considered as per the university rules.

# SEMESTER – VI
## BOCG601 ENTREPRENEURSHIP DEVELOPMENT

*Objective: To familiarize the students with the concept and overview of entrepreneurship with a view to enhance entrepreneurial talent. To impart knowledge on the basics of entrepreneurial skills and competencies to provide the participants with necessary inputs for creation of new ventures. To explore new vistas of entrepreneurship in 21st century environment to generate innovative business ideas*

### Module – I

To make the students understand about entrepreneurs and different classifications. Entrepreneur and entrepreneurship - Definition; traits and features; classification; Entrepreneurs; Women entrepreneurs; Role of entrepreneurs in India.

### Module – II

Create an awareness about EDP. Entrepreneurial development programme concept; Need for training; phases of EDP; curriculum & contents of Training Programme; Support systems, Target Groups; Institutions conducting EDPs in India and Kerala.

### Module – III

General awareness about identification of project financing new enterprises. Promotion of a venture; opportunity Analysis Project identification and selection; External environmental analysis economic, social, technological an competitive factors; Legal requirements for establishment of a new unit; loans; Overrun finance; Bridge finance; Venture capital; Providing finance in Approaching financing institutions for loans.

**Module –IV**

To identify different opportunities in small business. Small business Enterprise - Identifying the Business opportunity in various sectors - formalities for setting up of a small business enterprise - Institutions supporting small business enterprise - EDII (Entrepreneurship Development Institute of India), SIDO (Small Industries Development Organization NSIC (National small Industries Corporation Ltd.) NIESBUD (National Institute for Entrepreneurship and Small Business Development) Sickness in small business enterprise causes and remedies

**Module – V**

To understand about a project report relating to a small business. Project formulation - Meaning of a project report, significance, contents, formulation planning commissions guidelines for formulating a project report - specimen of a project report, problems of entrepreneurs, case studies of entrepreneurs.

**Books for Reference:**

1. Cliffton, Davis S. and Fylie, David E., Project Feasibility Analysis, John Wiley, New York,1977.
2. Desai A. N., Entrepreneur and Environment, Ashish, New Delhi,1990.
3. Drucker, Peter, Innovation and Entrepreileurship, Heinemann, London,1985

4. Jain Rajiv, Planning a Small Scale Industry: A guide to Entrepreneurs, S.S. Books, Delhi, 1984
5. Kumar S. A., Entrepreneurship in Small Industry, Discovery, New Delhi,1990

   McCleffand, D. C. and Winter, W. G., Motivating Economic Achievement, Free Press, New York, 1969

**SEMESTER VI**

**SDSG602: INFORMATICS & CYBER ETHICS**

## MODULE I
The Internet, TCP/IP, IP Addressing, Client Server Communication, Intranet, WWW, Web Browser and Web Server, Hyperlinks, URLs, Electronic mail.

## MODULE II
Internet as a knowledge repository, academic search techniques, creating cyber presence. Academic websites, open access initiatives, opens access publishing models, Introduction to use of IT in teaching and learning -Educational software, Academic services–INFLIBNET, NPTEL, NICNET, BRNET.

## MODULE III
Introduction to purchase of technology, License, Guarantee, Warranty, Basic concepts of IPR, copyrights and patents, plagiarism. IT & development, the free software movement

## MODULE IV
Cyber space, information overload, cyber ethics, cyber addictions, cybercrimes–categories –person, property, Government–types-stalking, harassment, threats, security & privacy issues.

## MODULE V
 Cyber Addiction, Information Overload, Health Issues, e-Waste and Green computing impact of IT on language & culture-localization issues- Unicode- IT and regional languages e-Governance in India, IT for National Integration, Role of IT.

**Book of Study:**

1. Alan Evans, Kendall Martin, Mary Anne Poatsy - "Technology in Action", Pearson

**References:**
1. Dinesh Maidasani "Learning Computer Fundamentals, MS Office and Internet &Web  Technology", Firewall Media, Lakshmi Publications.
 2. V Rajaraman - "Introduction to Information Technology", Prentice- Hall of India.
 3. Barkhs and U. Rama Mohan - HTML Black Book 3. "Cyber Law Crimes", Asia Law House,   New Edition
 4. Peter Nortons- Introduction to Computers, Sixth Edition, Published by Tata McGraw Hill .

**SEMESTER VI**
**SDSS603: DATA WAREHOUSING AND BIG DATA ANALYTICS**

**MODULE I**
**Overview and concepts Data Warehousing**
What is data warehousing - The building Blocks, Defining Features – Data warehouses and data marts, Overview of the components, Metadata in the data warehouse, Need for data warehousing, Basic elements of data warehousing, Trends in data warehousing.

**MODULE II**
**Concepts and techniques in Data Warehousing**
OLAP (Online analytical processing) definitions, Difference between OLAP and OLTP, Dimensional analysis - What are cubes?, Drill-down and roll-up - slice and dice or rotation, OLAP models, ROLAP versus MOLAP, defining schemas: Stars, snowflakes and fact constellations.

**MODULE III**
**Introduction to Data Mining (DM)**
DM Functionalities, Classification of DM Systems, Issues in DM – KDD Process, Data Pre-processing, Concept Description and Association Rule Mining, Classification and Prediction.

**MODULE IV**
**Introduction to Big Data**
What Is Big Data?, Driving the growth of Big Data, Differentiating between Big Data and traditional enterprise relational data, Challenges of Big Data, Big data analytics.

**MODULE V**
**The Computing environment**
The computing environment-Hardware, distributed systems, analytical tools, Hadoop, MapReduce.
Big Data Analytics Examples.

*Book of Study:*

1. J. Han, M. Kamber- Data Mining Concepts and Technique,2nd edition, Morgan Koufmann Publishers.
2. Paulraj Ponnian, "Data Warehousing Fundamentals", John Willey.
3. Jared Dean- Big Data, Data Mining, and Machine Learning: Value creation for business leaders and practitioners, Wiley Publishers.

## SEMESTER- VI
## SDSS604: ARTIFICIAL INTELLIGENCE

### MODULE I

Introduction- Artificial Intelligence: Concept and Definition, History of AI, Related concepts about AI, Physical symbol system hypothesis, Practical systems based on AI, Components of AI.

### MODULE II

Problem Solving through AI- Representation of AI problems, Production system, algorithm of problem solving, examples of AI problems, nature of AI problems.

### MODULE III

Basic concept of Heuristic search, Types of knowledge, Knowledge representation, knowledge storage, Introduction to Programming languages.

### MODULE IV

Machine learning, Planning, Understanding- Learning: an introduction, Types of learning, Planning, Understanding.

### MODULE V

Applications of AI-  Neural networks, pattern recognition, computer vision.

### Reference:

Ela Kumar, Artificial Intelligence, I K International Publishing House Pvt. Ltd.

**SEMESTER VI**
**SDSS605: MOBILE APPLICATIONS DEVELOPMENT(AOC)**

## MODULE I
Introduction to Android, Android Versions, Android Activity, Android Features and Architecture, Java JDK, Android SDK, Android Development Tools, Android Virtual Devices, Emulators, Dalvik Virtual Machine, Layouts – Linear, Absolute, Frame, Relative and Table.

## MODULE II
Android User Interface- Fundamental UI design , User interface with View-Text View, Buttons, Image Button, Edit Text, Check Box, Toggle Button, Radio Button and Radio Group, Progress Bar, Autocomplete Text View, Spinner, List View, Grid View, Image View, Scroll View, Custom Toast Alert and Time and Date Picker.

## MODULE III
Activity - Introduction, Intent, Intent_filter, Activity Life Cycle, Broadcast Life Cycle, Services, multimedia-Android System Architecture, Play Audio and Video, Text to Speech.

## MODULE IV
SQLite Database in Android- Introduction to SQLite Database, Creation and Connection of the Database, Extracting values from Cursors, Transactions, Telephoning and Messaging-SMS Telephony, Sending SMS, Receiving SMS, Wi-Fi Activity.

## MODULE V
Introduction to JSON and XML, Use of JSON, Syntax and Rule of JSON, JSON Name, JSON Values, JSON Objects, JSON Arrays, Parsing JSON and XML. Google Play services, Location services, Maps

*Book of Study:*
1. Prasanna Kumar Dixit - ANDROID, Vikas Publishing House.
2. AnubhavPradhan, Anil Deshpande, Composing Mobile Apps using Android, Wiley India Pvt.Ltd,2014

*References:*
1. Kevin Grant and Chris Haseman, Beginning Android Programming – Develop and Design, Pearson

**SEMESTER –VI**

**SDSS606: INTERNSHIP – III**

After the completion of the Sixth semester, students will have to undergo a minimum of two weeks internship programme in a reputed IT Company. Students can choose an industry in India or abroad for their internship. College will provide a certificate to prove their identity. A member of the faculty will supervise the student during their internship. IT Company having a minimum of two years' after establishment can be chosen for internship.

At the end of the internship, students should prepare a comprehensive report. The report of the work done by the student should be attested by the organization. Student should also produce a certificate of internship from the organization. All the above details should be submitted to the Head of the Department for evaluation.

# MODEL QUESTION PAPERS

# FIRST SEMESTER MODEL QUESTION PAPERS

# Mahatma Gandhi University

## Model Question Paper

### FIRST SEMESTER B.VOC (SOFTWARE DEVELOPMENT AND SYSTEM ADMINISTRATION) DEGREE EXAMINATION

### BOCG101– LISTENING AND SPEAKING SKILLS IN ENGLISH

**Time: Three Hours**                                          **Maximum: 80 Marks**

### PART A

**Answer any 10 questions. Each question carries 2 marks.**

1. Describe an auto rickshaw.
2. What is intensive reading?
3. What is the difference between a definite article and an indefinite article?
4. What is rising tone?
5. What is an index?
6. What is a phrasal verb?
7. Who is a good reader?
8. What is an embedded question?
9. Write a few phrases which can be used to express milddis agreement.
10. What are the three functions of conjunctions?
11. What are grammatical words?
12. What are people skills?

### PART B

**Answer any 6 questions. Each question carries 5 marks.**

13. What is telephone etiquette?
14. Who is an active listener?
15. Prepare a vote of thanks to be presented for the residents' association meeting.
16. Write short note on conjunctions.
17. What are the features of fluent speech?
18. You are a project leader. Introduce the members of your team to a visiting dignitary.
19. Write a short note on reading for a purpose.
20. What are the steps in cancelling and rescheduling appointments?
21. Describe the qualities of your college to your friends.

### PART C

**Answer any 2 questions. Each question carries 15 marks.**

22. Discuss ' the importance of social media' with two other participants in a group

discussion.
23. a) Write a conversation with your panchayath member, complaining about the lack of streetlights.

b) Write a model interview you make with an actor.

24. Write a note on subject-verb agreement.

25. What are the roles and functions in a group discussion?

# B.VOC DEGREE EXAMINATION,
# FIRST SEMESTER

## B.Voc Software Development and System Administration

### DISCRETE MATHEMATICS 1

**Time: 3 Hrs.**                                                      **Max Marks: 80**

### Part A
### *Answer any ten questions.*
### *Each question carries 2 marks.*

1. Explain the two type of quantification.
2. Write the contrapositive of the statement " if I will stay at home then it is snow tonight"
3. Define a contradiction.
4. Draw the graph of floor function.
5. Define lattice.
6. Is the "divides" relation on the set of positive integers reflexive?
7. Let f be a function from R→R with $f(x) = x^2$. Is f invertible?
8. Define least upper bound of a set with an example.
9. Find the g.c.d(120,500)
10. Find the prime factorisation of 7007.
11. State the fundamental theorem of arithmetic.
12. What are the quotient and remainder when 101 is divided by 11?

### Part B

### *Answer any six questions.*

### *Each question carries 5 marks.*

13. Find the truth value of $\exists x(x^2 \geq x)$ if the domain consists of (i) all integers (ii) all real numbers
14. Show that the hypothesis "it is not sunny this afternoon and it is colder than yesterday" "we will go swimming only if it is sunny" "if we do not go swimming then we will take a canoe trip" and if we take a canoe trip then we will be home by sunset' leads to the conclusion "we will be home by sunset".
15. Find the value of $\sum_{j=0}^{6} 2^{j+1}-2^j$.
16. Prove or disprove that the ceiling function$[x + y] = [x] +[y]$
17. If a and r are real numbers and r≠0 then prove that $\sum_{j=0}^{n} ar^j = \begin{cases} \frac{ar^{n+1}-a}{r-1} & if r \neq 1 \\ (n + 1)a & if r = 1 \end{cases}$

**18.** Give an example of a relation on set of positive integers which is not symmetric but transitive. Justify your example.

**19.** Draw the Hasse diagram for the partial ordering {(a,b)/a divides b} on {1,2,3,4,6,8,12}

**20.** Find the number of reflexive relations on a set with n elements.

**21.** Let m be a positive integer. If $a \equiv b \bmod m \land c \equiv d \bmod m$ then show that $a + c \equiv b + d \bmod m$ and $ac \equiv bd \bmod m$

## Part C

*Answer any two questions.*

*Each question carries 15 marks*

**22.** (a)Show that $(p \land q \to (p \lor q)$ is a tautology using logical equivalences.

(b) using truth table prove that $\neg p \land (p \land q) \to q$ is is a tautology.

**23.** (a) Let $R_1$ and $R_2$ be the relations on a set A represented by the matrices

$:M_{R1} = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ and $M_{R2} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ Find the matrices that represent (i)$R_1 \cup R_2$

(ii) $R_2 \circ R_1$

(b) Let R be the relation on the set of people such that $xRy$ if x and y and all people and x is older than y. show that R is not a partial ordering

**24.** (a) State and prove Chinese remainder theorem.

(b)Let *m* be a positive integer and a and b are integers .

If $a \equiv b \bmod m \land c \equiv d \bmod m$ then show that $a + c \equiv b + d \bmod m$ and $ac \equiv bd \bmod m$

**25.** Explain set and its operation with examples. Also explain different types of sets.

# SECOND SEMESTER MODEL QUESTION PAPERS

# Mahatma Gandhi University

## Model Question Paper

## Second Semester B.Voc. (SOFTWARE DEVELOPMENT AND SYSTEM ADMINISTRATION) DEGREE EXAMINATION

## BOCG201 –WRITING AND PRESENTATION SKILLS IN ENGLISH

**Time: Three Hours**                                          **Maximum: 80 Marks**

### Part A (Short Answer Questions)
### Answer any 10 questions (each questions carries 2 marks each)

1. What is a resume?
2. What is a group discussion?
3. What is a project report?
4. What is proxemics?
5. What is a letter of enquiry?
6. What is a flip chart?
7. What is a seminar?
8. What is a power of attorney?
9. What is netiquette?
10. What are narrative essays?
11. What are the components of a typical seminar paper?
12. What is para language?

**2 x 10 = 20 Marks**

### Part B (Descriptive / Short Essay Questions)

### Answer any 6 of the following questions

### Each question carries 5 Marks

13. What are the important points to be considered while sending collection letters?

14. What is a channel of communication? What are the different types of channel of communication?

15. Write a letter to the editor about the street dog menace in your city.

16. You want to sell your book collection. Prepare a notice to be put up in the college notice board.

17. Write a short note on Kinesics.

18. Prepare an agenda for the monthly board meeting of your firm.

19. What are the points to be remembered while filling an application form?

20. You are the owner of a supermarket. Write a letter inviting quotations from a wholesale dealer.

21. Write a short note on visual aids that are often used in presentations.

**5 x 6 = 30**

**Part C (Long Essays)**

**Answer Any two of the following**

**Each question carries 15 Marks**

22. You are Ravi/Jaya. Prepare an application letter and a resume for the post of an assistant engineer.

23. Write an essay arguing for or against single sex educational institutions.

24. What are the barriers to effective communication? How can we overcome them?

25. Write a descriptive essay about your favorite place.

**15 x 2 = 30**

# Mahatma Gandhi University

## Model Question Paper

### Second Semester B.Voc. (SOFTWARE DEVELOPMENT AND SYSTEM ADMINISTRATION) DEGREE EXAMINATION

### DISCRETE MATHEMATICS-II

**Maximum Marks: 80**                                    **Time: 3 hours**

### Part A
*Answer any 10 questions.*
*Each question carries 2 marks.*

1. Define wheel graph. Give an example.
2. Define in degree and out degree of a vertex in a directed graph.
3. State Dirac's theorem.
4. Briefly explain spanning tree of a simple graph.
5. Define preorder traversal.
6. Define tree with an example.
7. Write the dual of $x \cdot 1 = x$
8. Define Boolean sum
9. How many different Boolean functions of degree n are there?
10. What you mean by a Singular Matrix?
11. Define the rank of a matrix.
12. State Cayley- Hamilton Theorem.

### Part B
*Answer any six questions.*
*Each question carries 5 marks.*

13. Prove that there is a simple path between every pair of distinct vertices of a connected undirected graph.
14. Define (a) walk (b) adjacency matrix (c) cycles(d)complete graph (e)bipartite graph
15. Explain Konigsberg Bridge problem.
16. Explain breadth first search algorithm.
17. Explain (a) Rooted tree (b) child (c) leaf (d) Internal vertices (e) m- ary tree.
18. Verify one of the De Morgan's Laws in Boolean Algebra using table.
19. Find the sum-of-products expansion for the function $F(x, y, z) = (x + y)\acute{z}$

20. Reduce the matrix A $= \begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$ into normal form and hence find the rank of A.

21. Solve the system of equations using Cramer's rule
$$2x_1 + x_2 + 5x_3 + x_4 = 5$$
$$x_1 + x_2 - 3x_3 - 4x_4 = -1$$
$$3x_1 + 6x_2 - 2x_3 + x_4 = 8$$
$$2x_1 + 2x_2 + 2x_3 - 3x_4 = 2$$

**Part C**
*Answer any two questions.*
*Each question carries 15 marks*

22. State Handshaking theorem and hence prove that an undirected graph has an even number of vertices of odd degree.
Explain with an example.
23. Explain Depth first search algorithm with an example.
24. Check whether the following system of equations is consistent and hence solve using augmented matrix method :
$$x_1 + 2x_2 - 3x_3 - 4x_4 = 6$$
$$x_1 + 3x_2 + x_3 - 2x_4 = 4$$
$$2x_1 + 5x_2 - 2x_3 - 5x_4 = 10$$
25. (a) Construct circuits that produce the output $(x + y + z)\acute{x}\acute{y}\acute{z}$
(b) Construct the circuit for a fixture controlled by three switches.