

# **CURRICULUM**

## **DIPLOMA**

### **Information Technology**

**(Three-year program-semester system)**



Council for Technical Education and Vocational Training  
**Curriculum Development and Equivalence Division**  
**Sanothimi, Bhaktapur**

2008  
First Revision 2016  
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## **Introduction**

Information Technology (IT) is emerging field in the engineering and technology sector. Many people in the developed countries, developing countries and under developed countries have been given emphasis for the broader application of Information and Communication Technology (ICT). This field has been helping the world for the socio-economic development and it has been creating jobs opportunities both in public and private sectors as well as has been creating self-employment opportunities immensely. IT jobs are the top most earning job on global market and knowledge base industries are the new destination of economic growth.

This curriculum is designed with the purpose of producing middle level technical workforce equipped with knowledge and skills related to the areas of IT so as to meet the demand of such workforce in the country to contribute in the national streamline of poverty reduction of our country Nepal. This skills and knowledge included in this curriculum will be successful to deliver the individual needs and the needs in the field of IT.

## **Rationale of Revision**

Diploma in Information Technology curriculum was developed in 2008. This is the second revision after the implementation of its development. The rationales behind its revision are as follows:

- It crossed the 5 years maturity period of its implementation after its first revision in 2016 and similarly the implementing agencies/college have requested to revise this curriculum based on their teaching experiences.
- All Diploma level Engineering Courses' first and second semester subjects are re-adjusted and made same.
- The semester-wise re-adjustments of the existing subjects are felt necessary.
- It is needed to revisit its weightage in both theory and practical marks contents to make it more practical oriented.
- The technologies invented in this field seems necessary to be incorporated.

Furthermore, technicians are projected to grow faster than the average for all occupations. Jobs for Diploma in Information Technology are projected to increase at a faster-than-average rate. To cope with the national and international demands, the knowledge and skills of this curricular program should be updated to make the skills relevant and pertinent to the related information technology sector.

## **Curriculum Title**

Diploma in Information Technology.

## **Aim**

The program aims to produce middle level technical personnel in the field of IT with sound academic knowledge equipped with perfect technical skills.

## **Objectives**

The curriculum has following objectives:

1. To produce middle level competent technical workforce/human resources that could provide services to the public and private organizations in the field of IT.
2. To prepare such technicians who are able to work in public and private organizations in general communication, banking and business sectors in particular.

3. To prepare such technical workforce who will demonstrate positive attitude and respect for the profession and socio-cultural values.
4. To help in meeting the demand of such technical workforce required for the public and private organizations of Nepal.
5. To reduce the dependence on employing such technicians from foreign countries.
6. To create self-employment opportunities immensely.

### **Group Size**

The group size is a maximum of 48.

### **Entry Qualification**

- SLC pass or SEE or equivalent with minimum C Grade (2.0 Grade Point) in Mathematics and Science and 1.6 Grade Point or equivalent in English and as per the provisions mentioned in the admission guidelines of Office of the Controller of Examinations, CTEVT.
- Pre-diploma in related subject or equivalent with minimum 68.33%.
- Pass entrance examination administered by CTEVT.

### **Duration**

The total duration of this curricular program is three academic years [six semesters]. The program is based on semester system. Moreover, one semester consists of 19.5 academic weeks including evaluation period. Actual teaching learning Hrs. will be not less than 15 weeks in each semester.

### **Medium of Instruction**

The medium of instruction will be in English and/or Nepali.

### **Pattern of Attendance**

Minimum of 90% attendance in each subject is required to appear in the respective final examination.

### **Teacher (Instructor) and Student Ratio**

The ratio between teachers and students must be:

- Overall ratio of teacher and student must be 1:12 (at the institution level)
- 1:48 for theory and tutorial classes
- 1:12 for practical/demonstration
- 1:8 for bench work
- 75 % of the technical teachers must be full timer

### **Qualification of Instructional Staff**

- The program coordinator should be a master's degree holder in the related subject area.
- The disciplinary subject related teachers should be a bachelor's degree holder in the related subject area.
- The demonstrators should be a bachelor's degree holder or diploma or equivalent with 3 years' work experience in the related subject area.

The foundational subject related teacher (refer to course codes SH and MG) should be master's degree holder in the related subject area.

## **Instructional Media and Materials**

The following instructional media and materials are suggested for the effective instruction and demonstration.

- **Printed media materials:** Assignment sheets, case studies, handouts, performance checklists, textbooks etc.
- **Non-project media materials:** Displays, models, photographs, flipchart, poster, writing board etc.
- **Projected media materials:** Slides, Multimedia Projector.
- **Audio-visual materials:** Audiotapes, films, slide-tapes, videodisc, etc.
- **Computer based instructional materials:** Computer based training, interactive video etc.
- **Web-Based Instructional Materials** (Online learning)
- **Radio/Television/Telephone**
- **Education-focused social media platform**

## **Teaching learning methodologies**

The methods of teaching will be a combination of several approaches, such as Illustrated talk, Lecture, Tutorial, Group Discussion, Demonstration, Simulation, Guided practice, Practical experiences, Fieldwork, Report writing, Term paper presentation, Case analysis, Tutoring, Role-playing, Heuristic, Project work and Other Independent learning.

- Theory: Lecture, Discussion, Seminar, Interaction, Assignment, Group work.
- Practical: Demonstration, Observation, Guided practice, Self-practice, Project work.
- Internship: Industrial practice

## **Approach of Learning**

There will be inductive, deductive and learner-centered approaches of learning.

## **Examinations and Marking Scheme**

### **a. Internal assessment**

- There will be a transparent/fair evaluation system for each subject in both theory and practical exposure.
- Each subject will have internal assessment at regular intervals and students will get the feedback about it.
- Weightage of theory and practical marks are mentioned in curriculum structure.
- Continuous assessment format will be developed and applied by the evaluators for evaluating student's performance in the subjects related to the practical experience.

### **b. Final examination**

- Weightage of theory and practical marks are mentioned in structure.
- Students must pass in all subjects both in theory and practical for certification. If a student becomes unable to succeed in any subject, she/he will appear in the re-examination administered by CTEVT.
- Students will be allowed to appear in the final examination only after completing the internal assessment requirements.

### **c. Requirement for final practical examination**

- Professional of relevant subject teacher must evaluate final practical examinations.

- One evaluator in one setting can evaluate not more than 20 students.
  - Practical examination should be administered in actual situation on relevant subject with the provision of at least one internal evaluator from the concerned constituent or affiliated institute led by external evaluator nominated by CTEVT.
  - Provision of re-examination will be as per CTEVT policy.
- d. Final practicum evaluation will be based on:**
- Institutional practicum attendance - 10%
  - Logbook/Practicum book update - 10%
  - Spot performance (assigned task/practicum performance/identification/arrangement preparation/measurement) - 40%
  - Viva voce:
    - Internal examiner - 20%
    - External examiner - 20%
- e. Pass marks:**
- The students must secure minimum 40% marks in theory and 50% marks in practical. Moreover, the students must secure minimum pass marks in the internal assessment and in the yearly final examination of each subject to pass the subject.

### **Provision of Back Paper**

There will be the provision of back paper but a student must pass all the subjects of all year within six years from the enrollment date; however, there should be provision of chance exam for final year students as per CTEVT rules.

### **Disciplinary and Ethical Requirements**

- Intoxication, insubordination or rudeness to peers will result in immediate suspension followed by the review of the disciplinary review committee of the institute.
- Dishonesty in academic or practical activities will result in immediate suspension followed by administrative review, with possible expulsion.
- Illicit drug use, bearing arms in institute, threats or assaults to peers, faculty or staff will result in immediate suspension, followed by administrative review with possible expulsion.

### **Grading System**

The grading system will be as follows:

| <u><b>Grading</b></u> | <u><b>Overall marks</b></u> |
|-----------------------|-----------------------------|
| • Distinction:        | 80% and above               |
| • First division:     | 65% to below 80%            |
| • Second division:    | 50% to below 65%            |
| • Pass division:      | Pass marks to Below 50%     |

### **Certificate Awarded**

- Students who pass all the components of all subjects of all six semesters are considered to have successfully completed the course.
- Students who successfully complete the curricular program will be awarded with a degree of “**Diploma in Information Technology**”

**Career Path**

The graduates will be eligible for the position equivalent to Non- gazette 1st class/Level 5 (technical) as prescribed by the Public Service Commission of Nepal and other related agencies.

**General Attitudes Required**

A student should demonstrate following general attitudes for effective and active learning.

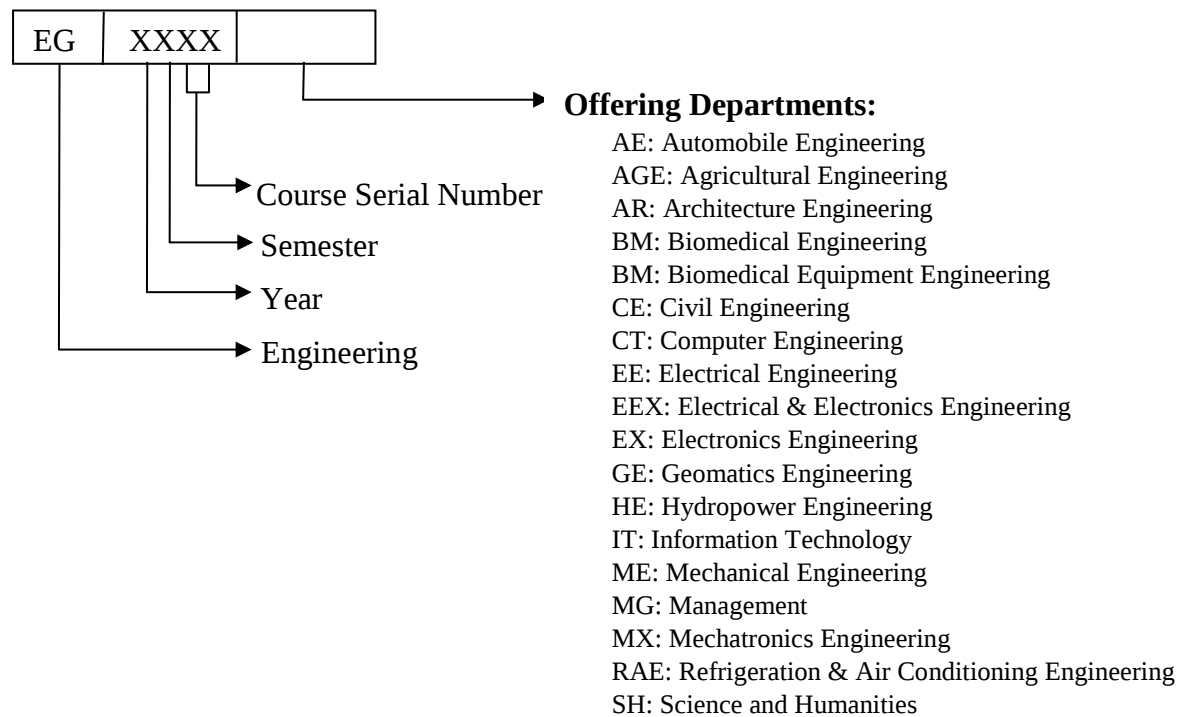
Acceptance, Affectionate, Ambitious, Aspiring, Candid, Caring, Change, Cheerful, Considerate, Cooperative, Courageous, Decisive, Determined, Devoted, Embraces, Endurance, Enthusiastic, Expansive, Faith, Flexible, Gloomy, Motivated, Perseverance, Thoughtful, Forgiving, Freedom, Friendly, Focused, Frugal, Generous, Goodwill, Grateful, Hardworking, Honest, Humble, Interested, Involved, Not jealous, Kind, Mature, Open minded, Tolerant, Optimistic, Positive, Practical, Punctual, Realistic, Reliable, Distant, Responsibility, Responsive, Responsible, Self-confident, Self-directed, Self-disciplined, Self-esteem, Self-giving, Self-reliant, Selfless, Sensitive, Serious, Sincere, Social independence, Sympathetic, Accepts others points of view, Thoughtful towards others, Trusting, Unpretentiousness, Unselfish, Willingness and Work-oriented.

**Provision of Elective Subjects**

There will be a provision of one for each elective I and elective II subjects in the third year/first part and third year/second part of this curriculum respectively. Subjects of Information Technology discipline such as Geographical Information System, E-commerce, Management Information System, Data Mining, Mobile Application Development, Telecommunication and Network and System Administration is offered as an elective. Forty percent students out of total number of enrolled students should be maintained in elective subject.

## Subjects Codes

Each subject is coded with a unique number preceded and followed by certain letters as mentioned in following chart:



## Curriculum Structure Diploma in Information Technology

Year: I

Part: I

| S.N. | Code No. | Subject                   | Teaching Scheme |   |   |     |              | Examination Scheme    |       |             |               |       |             | Total Marks | Remarks |
|------|----------|---------------------------|-----------------|---|---|-----|--------------|-----------------------|-------|-------------|---------------|-------|-------------|-------------|---------|
|      |          |                           |                 |   |   |     |              | DISTRIBUTION OF MARKS |       |             |               |       |             |             |         |
|      |          |                           | Mode            |   |   |     | Weekly Hours | Theory                |       |             | Practical     |       |             |             |         |
|      |          |                           | L               | T | P | Lab |              | *Assmt. Marks         | Final |             | *Assmt. Marks | Final |             |             |         |
|      |          |                           |                 |   |   |     |              |                       | Marks | Time (Hrs.) |               | Marks | Time (Hrs.) |             |         |
| 1    | EG1101SH | Applied Nepali            | 4               |   |   |     |              | 4                     | 20    | 80          | 3             |       |             |             | 100     |
| 2    | EG1102SH | Applied English           | 4               |   |   |     | 4            | 20                    | 80    | 3           |               |       |             | 100         |         |
| 3    | EG1103SH | Engineering Mathematics I | 4               | 2 |   |     | 6            | 20                    | 80    | 3           |               |       |             | 100         |         |
| 4    | EG1104SH | Engineering Physics I     | 4               | 2 |   | 2   | 8            | 20                    | 60    | 3           | 10            | 10    | 2           | 100         |         |
| 5    | EG1105SH | Engineering Chemistry I   | 4               | 2 |   | 2   | 8            | 20                    | 60    | 3           | 10            | 10    | 2           | 100         |         |
| 6    | EG1101AR | Engineering Drawing I     | 1               |   | 4 |     | 5            | 0                     | 0     |             | 60            | 40    | 4           | 100         |         |
| 7    | EG1101CT | Computer Application      | 2               |   | 2 |     | 4            | 10                    | 40    | 1.5         | 30            | 20    | 3           | 100         |         |
|      |          | Total                     | 23              | 6 | 6 | 4   | 39           |                       |       |             |               |       |             | 700         |         |

Year: I

Part: II

| S.N. | Code No. | Subject                    | Teaching Scheme |   |    |     |              | Examination Scheme    |       |             |               |       |             | Total Marks | Remarks |
|------|----------|----------------------------|-----------------|---|----|-----|--------------|-----------------------|-------|-------------|---------------|-------|-------------|-------------|---------|
|      |          |                            |                 |   |    |     |              | DISTRIBUTION OF MARKS |       |             |               |       |             |             |         |
|      |          |                            | Mode            |   |    |     | Weekly Hours | Theory                |       |             | Practical     |       |             |             |         |
|      |          |                            | L               | T | P  | Lab |              | *Assmt. Marks         | Final |             | *Assmt. Marks | Final |             |             |         |
|      |          |                            |                 |   |    |     |              |                       | Marks | Time (Hrs.) |               | Marks | Time (Hrs.) |             |         |
| 1    | EG1201SH | Engineering Mathematics II | 4               | 2 |    |     |              | 6                     | 20    | 80          | 3             |       |             |             | 100     |
| 2    | EG1202SH | Engineering Physics II     | 4               | 2 |    | 2   | 8            | 20                    | 60    | 3           | 10            | 10    | 2           | 100         |         |
| 3    | EG1203SH | Engineering Chemistry II   | 4               | 2 |    | 2   | 8            | 20                    | 60    | 3           | 10            | 10    | 2           | 100         |         |
| 4    | EG1201CE | Workshop Practice I        | 2               |   | 6  |     | 8            | 0                     | 0     |             | 60            | 40    | 4           | 100         |         |
| 5    | EG1201AR | Engineering Drawing II     | 0               |   | 4  |     | 4            | 0                     | 0     |             | 60            | 40    | 4           | 100         |         |
| 6    | EG1202CE | Applied Mechanics          | 3               | 2 |    | 2/2 | 6            | 20                    | 60    | 3           | 20            | 0     |             | 100         |         |
|      |          | Total                      | 17              | 8 | 10 | 5   | 40           |                       |       |             |               |       |             | 600         |         |

## Diploma in Information Technology

Year: II

Part: I

| S.N. | Code No. | Subject                                      | Teaching Scheme |   |   |     |              |              | Examination Scheme    |       |             |               |       |             | Total Marks | Remarks                |
|------|----------|----------------------------------------------|-----------------|---|---|-----|--------------|--------------|-----------------------|-------|-------------|---------------|-------|-------------|-------------|------------------------|
|      |          |                                              |                 |   |   |     |              |              | DISTRIBUTION OF MARKS |       |             |               |       |             |             |                        |
|      |          |                                              | Mode            |   |   |     | Weekly Hours | Credit Hours | Theory                |       |             | Practical     |       |             |             |                        |
|      |          |                                              | L               | T | P | Lab |              |              | *Assmt. Marks         | Final |             | *Assmt. Marks | Final |             |             |                        |
|      |          |                                              | L               | T | P | Lab | Weekly Hours | Credit Hours | *Assmt. Marks         | Marks | Time (Hrs.) | *Assmt. Marks | Marks | Time (Hrs.) |             |                        |
| 1    | EG2101SH | Engineering Mathematics III                  | 3               | 1 |   |     | 4            | 3            | 20                    | 80    | 3           |               |       |             | 100         | *continuous assessment |
| 2    | EG2101CT | C programming                                | 4               |   |   | 3   | 7            | 6            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 3    | EG2102CT | Web Technology I                             | 3               | 1 |   | 3   | 7            | 5            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 4    | EG2103CT | Digital Logic                                | 3               |   |   | 2   | 5            | 4            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 5    | EG2101IT | PC Troubleshoot and Maintenance              | 2               | 1 |   | 3   | 6            | 4            | 10                    | 40    | 1.5         | 30            | 20    | 3           | 100         |                        |
| 6    | EG2106CT | Basic Electrical and Electronics Engineering | 3               | 1 |   | 3   | 7            | 5            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
|      |          | Total                                        | 18              | 4 |   | 14  | 36           | 27           |                       |       |             |               |       |             | 800         |                        |

Year: II

Part: II

| S.N. | Code No. | Subject                                  | Teaching Scheme |   |   |     |              |              | Examination Scheme    |       |             |               |       |             | Total Marks | Remarks                |
|------|----------|------------------------------------------|-----------------|---|---|-----|--------------|--------------|-----------------------|-------|-------------|---------------|-------|-------------|-------------|------------------------|
|      |          |                                          |                 |   |   |     |              |              | DISTRIBUTION OF MARKS |       |             |               |       |             |             |                        |
|      |          |                                          | Mode            |   |   |     | Weekly Hours | Credit Hours | Theory                |       |             | Practical     |       |             |             |                        |
|      |          |                                          | L               | T | P | Lab |              |              | *Assmt. Marks         | Final |             | *Assmt. Marks | Final |             |             |                        |
|      |          |                                          | L               | T | P | Lab | Weekly Hours | Credit Hours | *Assmt. Marks         | Marks | Time (Hrs.) | *Assmt. Marks | Marks | Time (Hrs.) |             |                        |
| 1    | EG2201CT | Database Management System               | 3               | 1 |   | 2   | 6            | 4            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         | *continuous assessment |
| 2    | EG2202CT | Data Structure and Algorithm             | 3               | 1 |   | 3   | 7            | 5            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 3    | EG2203CT | Object Oriented Programming in Java      | 4               | 1 |   | 3   | 8            | 6            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 4    | EG2204CT | Microprocessor and Computer Architecture | 3               | 1 |   | 3   | 7            | 5            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 5    | EG2205CT | Web Technology II                        | 3               | 1 |   | 3   | 7            | 5            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 6    | EG2206CT | Statistics and Probability               | 3               | 1 |   |     | 4            | 3            | 20                    | 80    | 3           |               |       |             | 100         |                        |
|      |          | Total                                    | 19              | 6 |   | 14  | 39           | 28           |                       |       |             |               |       |             | 850         |                        |

## Diploma in Information Technology

Year: III

Part: I

| S.N. | Code No.   | Subject                            | Teaching Scheme |   |   |     |              |              | Examination Scheme    |       |             |               |       |             | Total Marks | Remarks                |
|------|------------|------------------------------------|-----------------|---|---|-----|--------------|--------------|-----------------------|-------|-------------|---------------|-------|-------------|-------------|------------------------|
|      |            |                                    |                 |   |   |     |              |              | DISTRIBUTION OF MARKS |       |             |               |       |             |             |                        |
|      |            |                                    | Mode            |   |   |     | Weekly Hours | Credit Hours | Theory                |       |             | Practical     |       |             |             |                        |
|      |            |                                    | L               | T | P | Lab |              |              | *Assmt. Marks         | Final |             | *Assmt. Marks | Final |             |             |                        |
|      |            |                                    |                 |   |   |     |              |              |                       | Marks | Time (Hrs.) |               | Marks | Time (Hrs.) |             |                        |
| 1    | EG3101CT   | Computer Graphics                  | 3               | 1 |   | 2   | 6            | 4            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         | *continuous assessment |
| 2    | EG3102CT   | Data Communication and Network     | 3               | 1 |   | 3   | 7            | 5            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 3    | EG3103CT   | Operating System                   | 3               |   |   | 2   | 5            | 4            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 4    | EG3101IT   | Cloud Computing                    | 3               |   |   | 2   | 5            | 4            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 5    | EG3102IT   | Software Development               | 3               |   |   | 2   | 5            | 4            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
| 6    |            | Elective-I                         | 3               | 1 |   | 3   | 7            | 5            | 20                    | 80    | 3           | 30            | 20    | 3           | 150         |                        |
|      | EG3103IT.1 | a) Geographical Information System |                 |   |   |     |              |              |                       |       |             |               |       |             |             |                        |
|      | EG3103IT.2 | b) Management Information System   |                 |   |   |     |              |              |                       |       |             |               |       |             |             |                        |
|      | EG3103IT.3 | c) Data Mining                     |                 |   |   |     |              |              |                       |       |             |               |       |             |             |                        |
| 7    | EG3104IT   | Minor Project                      |                 |   | 4 |     | 4            | 2            |                       |       |             | 60            | 40    | 3           | 100         |                        |
|      |            | Total                              | 18              | 3 | 4 | 14  | 39           | 28           |                       |       |             |               |       |             | 1000        |                        |

Year: III

Part: II

| S.N. | Code No.   | Subject                              | Teaching Scheme |   |    |     |              |              | Examination Scheme    |             |   |               |             |   | Total Marks | Remarks                |
|------|------------|--------------------------------------|-----------------|---|----|-----|--------------|--------------|-----------------------|-------------|---|---------------|-------------|---|-------------|------------------------|
|      |            |                                      |                 |   |    |     | Weekly Hours | Credit Hours | DISTRIBUTION OF MARKS |             |   |               |             |   |             |                        |
|      |            |                                      | Mode            |   |    |     |              |              | Theory                |             |   | Practical     |             |   |             |                        |
|      |            |                                      | L               | T | P  | Lab |              |              | *Assmt. Marks         | Final       |   | *Assmt. Marks | Final       |   |             |                        |
|      |            |                                      |                 |   |    |     |              |              | Marks                 | Time (Hrs.) |   | Marks         | Time (Hrs.) |   |             |                        |
| 1    | EG3201CT   | Multimedia System                    | 3               | 1 |    | 2   | 6            | 4            | 20                    | 80          | 3 | 30            | 20          | 3 | 150         | *continuous assessment |
| 2    | EG3202CT   | Internet of Things                   | 3               | 1 |    | 3   | 7            | 5            | 20                    | 80          | 3 | 30            | 20          | 3 | 150         |                        |
| 3    | EG3201MG   | Entrepreneurship Development         | 3               |   | 2  |     | 5            | 4            | 20                    | 60          | 3 | 10            | 10          | 2 | 100         |                        |
| 4    | EG3201IT   | Cyber Security                       | 3               |   |    | 2   | 5            | 4            | 20                    | 80          | 3 | 30            | 20          | 3 | 150         |                        |
| 5    |            | Elective-II                          | 3               | 1 |    | 3   | 7            | 5            | 20                    | 80          | 3 | 30            | 20          | 3 | 150         |                        |
|      | EG3202IT.1 | a) E-commerce                        |                 |   |    |     |              |              |                       |             |   |               |             |   |             |                        |
|      | EG3202IT.2 | b) Mobile Application Development    |                 |   |    |     |              |              |                       |             |   |               |             |   |             |                        |
|      | EG3202IT.3 | c) Telecommunication                 |                 |   |    |     |              |              |                       |             |   |               |             |   |             |                        |
|      | EG3202IT.4 | d) Network and System Administration |                 |   |    |     |              |              |                       |             |   |               |             |   |             |                        |
| 6    | EG3203IT   | Major Project                        |                 |   | 8  |     | 8            | 4            |                       |             |   | 120           | 80          |   | 200         |                        |
|      |            | Total                                | 15              | 3 | 10 | 10  | 38           | 26           |                       |             |   |               |             |   | 900         |                        |

First Year (First and Second Semesters)

[See Separate Curriculum]

([Year I Part I and Year I Part II) Engineering All

**Second Year/ First Part**

| <b>S.N.</b> | <b>Course Code</b> | <b>Subject</b>                               |
|-------------|--------------------|----------------------------------------------|
| 1           | EG2101SH           | Engineering Mathematics III                  |
| 2           | EG2101CT           | C programming                                |
| 3           | EG2102CT           | Web Technology I                             |
| 4           | EG2103CT           | Digital Logic                                |
| 5           | EG2101IT           | PC Troubleshoot and Maintenance              |
| 6           | EG2106CT           | Basic Electrical and Electronics Engineering |

**Engineering Mathematics III**  
EG2101SH

**Year: II**  
**Part: I**

**Total: 4 hours/week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hours/week**  
**Practical: hours/week**  
**Lab: hours/week**

**Course Description:**

This course consists of five units namely: Applications of derivatives, Partial derivatives, application of Anti-derivatives, Differential equations and Fourier series; which are basically necessary to develop mathematical knowledge and helpful for understanding as well as practicing their skills in the related engineering fields.

**Course Objectives:**

On completion of this course, students will be able to understand the concept of the following topics and apply them in the related fields of different engineering areas: Applications of derivatives and anti-derivatives, Partial derivatives, differential equations and Fourier series.

**Course Contents:**

**Theory**

**Unit 1. Applications of Derivatives** **[12 Hrs.]**

- 1.1. Derivatives of inverse circular functions and hyperbolic functions
- 1.2. Differentials, tangent and normal
- 1.3. Maxima and minima, concavity, increasing and decreasing functions
- 1.4. Rate measures
- 1.5. Indeterminate forms:  $\frac{0}{0}$ ,  $\frac{\infty}{\infty}$  and  $\infty - \infty$ , L'Hospital's Rule (without proof)

**Unit 2. Partial Derivatives** **[6 Hrs.]**

- 2.1. Functions of more than two variables
- 2.2. Partial derivative from First principles
- 2.3. Partial derivatives of First and higher orders
- 2.4. Euler's theorem for function of two variables
- 2.5. Partial derivatives of composite functions

**Unit 3. Applications of Anti-derivatives** **[8 Hrs.]**

- 3.1. Standard Integrals, related numerical problems
- 3.2. **Basic idea of curve sketching:** odd and even functions, periodicity of a function, symmetry (about x-axis, y-axis and origin), monotonicity of a function, sketching graphs of polynomial, trigonometric, exponential, and logarithmic functions (simple cases only)
- 3.3. Area under a curve using limit of sum (without proof)
- 3.4. Area between two curves (without proof)
- 3.5. Area of closed a curve (circle and ellipse only)

**Unit 4. Differential Equations** **[14 Hrs.]**

- 4.1. **Ordinary Differential Equations (ODEs)**
  - 4.1.1. Definitions, order and degree of differential equation
  - 4.1.2. Differential equation of First order and First degree

- 4.1.3. Variable separation and variable change methods
- 4.1.4. Homogeneous and linear differential equation of First order
- 4.1.5. Exact differential equation, condition of exactness
- 4.1.6. Simple applications of First order differential equations

**4.2. Partial Differential Equations (PDEs)**

- 4.2.1. Basic concepts, definition and formation
- 4.2.2. General solution of linear PDEs of first order ( $Pp + Qq = R$  form)

**Unit 5. Fourier Series**

**[5 Hrs.]**

- 5.1. Periodic functions and fundamental period of periodic functions
- 5.2. Odd and even functions with their properties
- 5.3. Trigonometric series
- 5.4. Fourier's series in an interval of period  $2\pi$  (arbitrary range is not required)

**Tutorial:**

**[15 Hrs.]**

- 1. Applications of Derivatives [4 Hrs.]
- 2. Partial Derivatives [2 Hrs.]
- 3. Applications of Anti-derivatives [3 Hrs.]
- 4. Differential Equations [5 Hrs.]
- 5. Fourier Series [1 Hrs.]

**Evaluation Scheme:**

**Unit wise Marks division for Final**

| S. No. | Units                            | Short questions<br>(2 marks) | Long questions<br>(4 marks) | Total<br>Marks |
|--------|----------------------------------|------------------------------|-----------------------------|----------------|
| 1      | Applications of Derivatives      | 4 x 2 = 8                    | 3 x 4 = 12                  | 20             |
| 2      | Partial Derivatives              | 2 x 2 = 4                    | 2 x 4 = 8                   | 12             |
| 3      | Applications of Anti-derivatives | 3 x 2 = 6                    | 3 x 4 = 12                  | 18             |
| 4      | Differential Equations           | 4 x 2 = 8                    | 4 x 4 = 16                  | 24             |
| 5      | Fourier Series                   | 1 x 2 = 2                    | 1 x 4 = 4                   | 6              |
|        | <b>Total</b>                     | <b>14 x 2 = 28</b>           | <b>13 x 4 = 52</b>          | <b>80</b>      |

**References:**

- 1. Thapa et al., Engineering Mathematics (Volume I, Three Years Diploma), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
- 2. Bajracharya et al., Basic Mathematics (Grade XI/XII), Sukunda Pustak Bhawan, Bhotahity, Kathmandu, Nepal
- 3. Kryszig E., Advanced Engineering Mathematics, wile-Easter Publication, New Delhi, India
- 4. Nath et al., Engineering Mathematics III, Vidhyarthi Publisher & distributors, Kathmandu, Nepal
- 5. Other references selected by the related lecturer(s) from among the texts available in the market that meet the content of this subject.

## **C Programming** EG2101CT

**Year: II**  
**Part: I**

**Total: 7 hours /week**  
**Lecture: 4 hours/week**  
**Tutorial: hour/week**  
**Practical: hours/week**  
**Lab: 3 hours/week**

### **Course description:**

This course deals with the problem-solving techniques using C programming language. It provides the students with the knowledge of the basic features of the C language such as data types, keywords, operators, control structure, array, string handling functions, functions, structure and union, pointer and file handling.

### **Course objectives:**

After completion of this course students will be able to:

1. Implement fundamentals concepts of programming language.
2. Apply sequential, conditional and looping statements while developing programs.
3. Create modular programs using array.
4. Make and apply programs using function, strings, string handling function, structure and union, pointer and data files.

### **Course Contents:**

#### **Theory**

#### **Unit 1. Programming Language Fundamentals [6 Hrs.]**

- 1.1. Introduction to Program and Programming Language
- 1.2. Types of Programming Language (Low Level and High-Level Language)
- 1.3. Language Translator (Assembler, Compiler and Interpreter)
- 1.4. Program Error, Types of Error (Syntax, Semantic, Runtime Error)
- 1.5. Program Design Tools (Algorithm, Flowchart)

#### **Unit 2. Introduction to C [8 Hrs.]**

- 2.1. Overview and History of C
- 2.2. Features, Advantages and Disadvantages of C
- 2.3. Structure of C Program, Compiling Process
- 2.4. Character set used in C, Data types, Variables. C Tokens (Keywords, Identifier, Constants, Operators), Header files, Library function
- 2.5. Preprocessor Directives, Escape Sequence, Comments
- 2.6. Input Output Operation
  - 2.6.1. Formatted input/output function (printf(), scanf() )
  - 2.6.2. Unformatted input/output function (getchar(), putchar(), gets(), puts(), getc(), putc() )

#### **Unit 3. Operators and Expressions [4 Hrs.]**

- 3.1. Operators, Operand, Operation, Expression
- 3.2. Types of Operators (Unary, Binary, Ternary, Arithmetic, Relational, Logical, Assignment, Increment/Decrement, Conditional, Bitwise, Size-of Operators)

#### **Unit 4. Control Structure/Statement [12 Hrs.]**

- 4.1. Sequential Statement
- 4.2. Decision/Selection/Conditional Statement
  - 4.2.1. if statement

- 4.2.2. if...else statement
- 4.2.3. if...else if...else statement
- 4.2.4. Nested if...else statement
- 4.2.5. Switch statement
- 4.3. Loop (for, while and do-while)
- 4.4. Jump statement (break, continue, goto statement)

## Unit 5. Array and String [8 Hrs.]

- 5.1. Introduction to Array, Declaration, Initialization
- 5.2. Types of Arrays (1-D Array, Multi-dimensional Array)
- 5.3. String, Array of String
- 5.4. String Handling Function (`strlen()`, `strrev()`, `strupr()`, `strlwr()`, `strcpy()`, `strcat()`, `strcmp()`)

## Unit 6. Function [6 Hrs.]

- 6.1. Introduction
- 6.2. Function components (function declaration, function call, function definition)
- 6.3. Types of function (library/built-in function and user-defined function)
- 6.4. Category of function according to return value and arguments
- 6.5. Parameter passing in C (call by value and call by reference)
- 6.6. Recursion (recursive function)
- 6.7. Passing array to function
- 6.8. Passing string to function

## Unit 7. Structure and Union [6 Hrs.]

- 7.1. Structure: definition, declaration, initialization, size of structure
- 7.2. Accessing member of Structure
- 7.3. Array of Structure
- 7.4. Nested Structure
- 7.5. Union: definition, declaration, size of union
- 7.6. Structure Vs. Union

## Unit 8. Pointer [4 Hrs.]

- 8.1. Introduction to Pointer
- 8.2. Address (&) and indirection (\*) operator
- 8.3. Pointer Arithmetic Operations
- 8.4. Pointer to Pointer in C
- 8.5. Dynamic Memory Allocation (malloc(), calloc(), realloc(), free() )

## Unit 9. Data files [6 Hrs.]

- 9.1. Introduction to data files
- 9.2. Types of file (text file, binary file)
- 9.3. File handling operation
- 9.4. Opening and closing file
- 9.5. Creating file
- 9.6. Library functions for READING from a file and WRITING to a file: (fputs, fgets, fputc, fgetc fprintf, fscanf)

**Practical:** [45 Hrs.]

1. Write programs to implement sequential structure.

2. Write programs to implement conditional structure.
3. Write programs to implement looping structure.
4. Write programs to implement array and string handling function.
5. Write programs to implement library function, user defined function and recursive function.
6. Write programs to implement structure and union.
7. Write programs to implement pointer.
8. Write programs to read from a file and write to data file using fputs, fgets, fputc, fgetc fprintf, fscanf function.

| <b>Final written exam evaluation scheme</b> |                                   |              |                            |
|---------------------------------------------|-----------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                      | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Programming Language Fundamentals | 6            | 8                          |
| 2                                           | Introduction to C                 | 8            | 11                         |
| 3                                           | Operators and Expressions         | 4            | 5                          |
| 4                                           | Control Structure/Statement       | 12           | 16                         |
| 5                                           | Array and String                  | 8            | 11                         |
| 6                                           | Function                          | 6            | 8                          |
| 7                                           | Structure and Union               | 6            | 8                          |
| 8                                           | Pointer                           | 4            | 5                          |
| 9                                           | Data files                        | 6            | 8                          |
|                                             | <b>Total</b>                      | <b>60</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

#### **References:**

1. Gotterfried, B. (2001). Programming with C. (3rd ed.). India: McGraw Hill Education.
2. Bhatta, R.D. (2015). A Text Book of C Programming. (3rd ed.). Nepal: Vidyarthi Pustak Bhandar.
3. Thareja, R. (2015). Introduction to C Programming. (2nd ed.). India: Oxford University Press.
4. Kantekar, Y. (2012). Let us C. (10th ed.). India: BPB Publications.
5. Balagurusamy, E. (2008). Programming in ANSI C. (6th ed.). India: The McGraw Hill Companies.

## **Web Technology I** EG2102CT

**Year: II**  
**Part: I**

**Total: 7 hours/week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: hours/week**  
**Lab: 3 hours/week**

### **Course description:**

This course is designed to provide skills to the student to develop modern web application and gain a broad understanding of the Web Technology. This course focuses on the development of dynamic web contents and applications to facilitate information distribution. The course will initiate students to the different web development tools and technology such as HTML, HTML 5, CSS, JavaScript and GUI based tools.

### **Course objectives:**

After completion of this course students will be able to:

1. Familiarize with the basic technique of web technology and web page design.
2. Use recent web development software to develop dynamic web contents and applications.
3. Design the client-side web site with features of control of client side.

### **Course Contents:**

#### **Theory**

#### **Unit 1. Internet & Web** **[5 Hrs.]**

- 1.1. History of Internet and Web
- 1.2. Uses of Internet and Services
- 1.3. Introduction to WWW
- 1.4. Component of WWW (Web, Webpage, Website, Homepage, Web Browsers, Web Servers, URL and Search Engines)
- 1.5. Types of Web Pages & its Processing in WWW
- 1.6. Internet protocols (TCP/IP, ARP, HTTP, FTP, SMTP, POP, SNMP) and applications

#### **Unit 2. Hypertext Markup Language (HTML)** **[15 Hrs.]**

- 2.1. Introduction to HTML
- 2.2. Basic Structure of HTML (HTML, HEAD, TITLE, BODY)
- 2.3. BODY Attributes (Forecolor: TEXT and Background color: BGCOLOR, Background Image, Background Sound)
- 2.4. HTML Elements
- 2.5. HTML TAGS and Attributes
  - 2.5.1. Singular Tags
  - 2.5.2. Paired Tags
- 2.6. Character formatting
  - 2.6.1. Heading Tag (H1 to H6) and attribute (ALIGN)
  - 2.6.2. Paragraph Tag and attribute (ALIGN)
  - 2.6.3. Line Break (BR)
  - 2.6.4. Horizontal Rule (HR) and attribute (ALIGN, SIZE, WIDTH, NOSHADE)
  - 2.6.5. Comment in HTML (<!-- -->)
  - 2.6.6. Text Formatting (B, I, U, BLOCKQUOTE, Q, PREFORMATTED, SUB, SUP, EM, STRIKE, SMALL, BIG, CENTER)
- 2.7. FONT tag and Attributes (COLOR, FACE and SIZE)

- 2.8. List Tags and Attributes
  - 2.8.1. Ordered List: OL, LI, and OL Attributes (TYPE - 1, I, i, A, a, START, VALUE)
  - 2.8.2. Unordered List: UL, LI, and UL Attributes (TYPE- Disc, Circle, Square)
  - 2.8.3. Definition List: DL, DT, DD
- 2.9. Inserting IMAGES and OBJECTS
  - 2.9.1. Images: IMG; Attributes (ALIGN, SRC, WIDTH, HEIGHT, ALT, BORDER)
  - 2.9.2. Objects: OBJECT; Attributes (DATA, WIDTH, HEIGHT)
- 2.10. MARQUEE tag and attributes
- 2.11. HYPERLINK and Anchor Tag
  - 2.11.1. Creating Internal Links: Links to other places in the same HTML documents
  - 2.11.2. Creating Local Links: Link to other HTML documents or data objects
  - 2.11.3. Creating Global Links: Links to places in other HTML documents
  - 2.11.4. Anchor Tag and Hyperlink<A HREF TARGET>and<A NAME>
  - 2.11.5. Creating Image Links
- 2.12. TABLE Tag
  - 2.12.1. Creating TABLE, TR, TH and TD and attributes (ALIGN, CELSPACING, CELLPADDING, BORDER, WIDTH, BGCOLOR, COLSPAN, ROWSPAN, CAPTION, CENTER)
- 2.13. FRAME and FRAMESET Tags
  - 2.13.1. FRAMESET tag and Attributes (ROWS, COLS and Absolute dimensions, Percentage dimensions, Relative dimensions)
  - 2.13.2. FRAME tag and Attributes (SRC, NAME, MARGIN HEIGHT, MARGIN WIDTH, SCROLLINGAUTONORESIZE)
  - 2.13.3. NOFRAMES tag
- 2.14. HTML FORM
  - 2.14.1. FORM tag and attributes (METHOD, ACTION, TARGET)
  - 2.14.2. INPUT element and attributes (TYPE – TEXT, PASSWORD, CHECKBOX, HIDDEN, IMAGE, FILE, RANGE, RADIO, RESET, SUBMIT, BUTTON; VALUE, SRC, CHECKED, SIZE, MAXLENGTH, ALIGN)
  - 2.14.3. SELECT, OPTION Tag and attributes (NAME, SIZE, MULTIPLE / SINGLE, SELECTED)
  - 2.14.4. TEXT AREA Tag and attributes (ROWS, COLS, READ ONLY, DISABLED)

### **Unit 3. HTML 5 and Features**

**[5 Hrs.]**

- 3.1. Introduction
- 3.2. Difference between HTML and HTML 5
- 3.3. HTML 5 New Semantics Elements (HEADER, FOOTER, SECTION)
- 3.4. HTML 5 New Elements
  - 3.4.1. Tables, Images, Colors, Canvas, Forms
  - 3.4.2. Interactive Elements
  - 3.4.3. Graphics
  - 3.4.4. Multimedia

### **Unit 4. HTML Editors and Tools**

**[5 Hrs.]**

- 4.1. Introduction to HTML Editors and HTML Converters
- 4.2. HTML Editors and tools
  - 4.2.1. Use of different HTML editors and tools like Dreamweaver, Microsoft Front Page Notepad++, etc.
- 4.3. Graphical and Animation Tools
  - 4.3.1. Use of different graphical and animation tools like Adobe Photoshop, MS Paint, Flash, etc.
  - 4.3.2. Adding Sounds and Animation to the web page (using embed tag)

#### **Unit 5. Cascading Style Sheet (CSS) [5 Hrs.]**

- 5.1. Introduction to Cascading Style Sheets (CSS) and advantages of using CSS
- 5.2. Basic Syntax
  - 5.2.1. Creating Cascading Style Sheets (CSS) using STYLE tag
- 5.3. Types of Style Sheets
  - 5.3.1. Inline Style Sheets
  - 5.3.2. Internal/ Embedded Style Sheets
  - 5.3.3. External Style Sheets
- 5.4. Introduction to different Styles and their Attributes
  - 5.4.1. Backgrounds and Color Styles and Attributes
  - 5.4.2. Fonts and Text Styles and Attributes
  - 5.4.3. Margin, Padding and Border Styles and Attributes
  - 5.4.4. List Styles and Table Layouts
  - 5.4.5. Additional Features - Grouping Style Sheets, Assigning Classes and Span
  - 5.4.6. DIV Tag
  - 5.4.7. Responsive Web Design

#### **Unit 6. Introduction to Server Side and Client-Side Scripting [2 Hrs.]**

- 6.1. Overview of Server Side and Client-Side Scripting
- 6.2. Difference between Server Side and Client-Side Scripting
- 6.3. Advantages and Disadvantages of Server Side and Client-Side Scripting

#### **Unit 7. JavaScript [8 Hrs.]**

- 7.1. Overview of JavaScript
- 7.2. Advantages of JavaScript
- 7.3. Implementing JavaScript code to HTML page using SCRIPT tag
- 7.4. Variables in JavaScript
- 7.5. JavaScript Data Type-Variant subtypes
- 7.6. JavaScript Functions
- 7.7. Event Handling and JavaScript objects
- 7.8. Document Object Model in JavaScript
  - 7.8.1. Browser Objects and Events
  - 7.8.2. Document Objects and Events
  - 7.8.3. Form Objects and Events
- 7.9. Dialog Box supported by JavaScript
- 7.10. Form validation

#### **Practical: [45 Hrs.]**

- 1. Design a simple page using Character formatting i.e. (Heading Tag (H1 to H6), Paragraph Tag, Line Break, Horizontal Rule, Text Formatting (B, I, U, SMALL, BIG,

- EM, SUB, SUP, PRE, STRIKE, CENTER and BLOCKQUOTE) and also use FONT tag and Attributes (COLOR, FACE and SIZE) using HTML.
- Demonstrate the use of different LIST and their attributes using HTML.
  - Demonstrate the use of TABLE (use ALIGN, CELSPACING, CELLPADDING, BORDER, WIDTH, BGCOLOR, COLSPAN, ROWSPAN, CAPTION, CENTER attributes) using HTML.
  - Demonstrate the use of HYPERLINK (use internal link, local link, global link and image link) in HTML.
  - Create a page containing 3 FRAMES with 1<sup>st</sup> frame covering 40% of the screen (vertical coverage) and remaining screen should be horizontally divided into 2 frames (40% and 60%). The 1<sup>st</sup> frame should contain a banner image and 2<sup>nd</sup> frame contains the links (i.e. link1 and link2) and the links of these items must be opened in the 3<sup>rd</sup> frame. Use FRAMESET and FRAME tags of HTML to create the pages.
  - Design a FORM containing username, password, radio button, checkbox, drop-down menu, textarea (for comment section), submit button, and reset button using HTML.
  - Demonstrate the use of different types of CSS in HTML.
  - Demonstrate the use of class and div tags in HTML.
  - Demonstrate the use of JavaScript code to the html page.
  - Develop a simple web site with different simple web pages.

| Final written exam evaluation scheme |                                                       |           |                     |
|--------------------------------------|-------------------------------------------------------|-----------|---------------------|
| Unit                                 | Title                                                 | Hours     | Marks Distribution* |
| 1                                    | Internet & Web                                        | 5         | 10                  |
| 2                                    | Hypertext Markup Language (HTML)                      | 15        | 24                  |
| 3                                    | HTML 5 and Features                                   | 5         | 8                   |
| 4                                    | HTML Editors and Tools                                | 5         | 8                   |
| 5                                    | Cascading Style Sheet (CSS)                           | 5         | 10                  |
| 6                                    | Introduction to Server Side and Client-Side Scripting | 2         | 5                   |
| 7                                    | JavaScript                                            | 8         | 15                  |
|                                      | <b>Total</b>                                          | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

#### References:

- Bayross, Ivan (New Edition), HTML, DHTML, JavaScript & PHP, BPB publications
- Kamal Raj, "Internet & Web Design", Tata McGraw Hill Wiley, Chris Bates, Web programming Dreamtech India Pvt. Ltd
- Keith Jeremy, "HTML5 for Web Designers"

**Digital Logic**  
EG2103CT

**Year: II**  
**Part: I**

**Total: 5 hours/week**  
**Lecture: 3 hours/week**  
**Tutorial: hour/week**  
**Practical: hours/week**  
**Lab: 2 hours/week**

**Course Description:**

This course introduces logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of digital signal, number system, logic gates, minimization techniques, and combinational as well as sequential circuits and concludes with digital logic families and digital displays.

**Course Objective:**

After completing this course, the students will be able to:

1. Design the combinational logic circuits.
2. Explain the sequential logic circuits.
3. Design problem based / predefined logic-based circuits.

**Course Contents:**

**Theory**

**Unit 1. Introduction to Digital Signal** **[3 Hrs.]**

- 1.1. Analog Signal and Digital Signal
- 1.2. Advantages of Digital over Analog Signals
- 1.3. Representation of Digital Signal
- 1.4. Applications of Digital Signal

**Unit 2. Number Systems and Codes** **[4 Hrs.]**

- 2.1. Two State Devices
- 2.2. Decimal Number System
- 2.3. Binary Number System
- 2.4. Octal Number System
- 2.5. Hexadecimal Number System
- 2.6. Conversions among Different Number Systems
- 2.7. Fractions Conversion
- 2.8. BCD Code
- 2.9. Gray Code
- 2.10. Alphanumeric Code
  - 2.10.1. ASCII Code
  - 2.10.2. EBCDIC Code

**Unit 3. Arithmetic Logic Operations** **[5 Hrs.]**

- 3.1. Binary Arithmetic
  - 3.1.1. Binary Addition
  - 3.1.2. Binary Subtraction
- 3.2.  $r$ 's Complement and  $(r-1)$ 's Complement Method for decimal and binary system

**Unit 4. Logic Gates and Boolean Function** **[10 Hrs.]**

- 4.1. Basic Gates: AND, OR, NOT
- 4.2. Universal Gates: NAND, NOR

- 4.3. Exclusive Gates: XOR, XNOR
- 4.4. DeMorgan's Theorems
- 4.5. The Universal Properties of the NAND Gates
- 4.6. The Universal Properties of the NOR Gates
- 4.7. Pulse Operation in Logic Gates
- 4.8. Combination of Logic Gates
- 4.9. Boolean Algebra and its Properties/Laws
- 4.10. Boolean Expression in Logic Gates
- 4.11. Simplification of Boolean Expressions

#### **Unit 5. Logic Simplification**

**[5 Hrs.]**

- 5.1. Karnaugh Map
  - 5.1.1. K-Map Simplification for Two Input Variables
  - 5.1.2. K-Map Simplification for Three Input Variables
  - 5.1.3. K-Map Simplification for Four Input Variables
- 5.2. Sum of Product (SOP) Simplification
- 5.3. Product of Sums (POS) Simplification
- 5.4. K-Maps with *Don't Care* Conditions

#### **Unit 6. Combinational Logic Circuits**

**[8 Hrs.]**

- 6.1. Half Adder, Full Adder and Parallel Adder
- 6.2. Half Subtractors and Full Subtractors
- 6.3. Decimal to Binary Encoder and Decimal to BCD Encoder
- 6.4. Binary to Decimal Decoder, BCD to Decimal Decoder and Seven Segment Display Decoder
- 6.5. Data Transmissions, 4-to-1 Multiplexer and 8-to-1 Multiplexer
- 6.6. Demultiplexer and Decoder Relations
- 6.7. 1-to-4 Demultiplexer and 1-to- 16 Demultiplexer

#### **Unit 7. Sequential Logic Circuits**

**[8 Hrs.]**

- 7.1. Flip-Flops
  - 7.1.1. RS Flip-Flop and its Truth Table
  - 7.1.2. D Flip-Flop and its Truth Table
  - 7.1.3. JK Flip-Flop and its Truth Table
  - 7.1.4. T Flip-Flop and its Truth Table
  - 7.1.5. Master-Slave Flip-Flops
  - 7.1.6. Applications of Flip-Flop
- 7.2. Shift-Registers
  - 7.2.1. Flip-flop as a One-bit Memory Device
  - 7.2.2. Arithmetic Right/Left Shift Registers
  - 7.2.3. Serial-in Serial-out (SISO) Shift Register
  - 7.2.4. Serial-in Parallel-out (SIPO) Shift Register
  - 7.2.5. Parallel-in Serial-out (PISO) Shift Register
  - 7.2.6. Parallel-in Parallel-out (PIPO) Shift Register
  - 7.2.7. Applications of Shift Registers
- 7.3. Counters
  - 7.3.1. Synchronous Counters
  - 7.3.2. Ripple Counters
  - 7.3.3. M- Modulus Counters
  - 7.3.4. Decade Counters

- 7.3.5. Ring Counters
- 7.3.6. Applications of Counters

## Unit 8. Digital Displays

[2 Hrs.]

- 8.1. LED Display
- 8.2. 7-Segments Display

### Practical:

[30 Hrs.]

1. Verify the truth tables of basic gates and other gates: AND, OR, NOT, NAND, NOR, XOR and XNOR Gates
2. Realize and verify truth tables applying DeMorgan's Theorems
3. Verify the universal properties of the NAND gate and NOR gate.
4. Realize and verify truth tables of binary half adder/Subtractor and full adder/Subtractor
5. Implement decimal to 3-4-bit binary encoder
6. Realizing the function of 4-bit binary decoder
7. Realizing the function of 4-to-1 multiplexer and 1-to- 4 demultiplexer circuits.
8. Realizing the function of flip-flops, RS, D, JK, T flip-flops
9. Realizing the function shift-registers: SISO, SIPO, PISO and PIPO
10. Realizing the function ripple counters
11. Realizing the function synchronous counters
12. Realizing and designing of seven-segment display-decoder logic circuit

| Final written exam evaluation scheme |                                  |       |                     |
|--------------------------------------|----------------------------------|-------|---------------------|
| Unit                                 | Title                            | Hours | Marks Distribution* |
| 1                                    | Introduction to Digital Signal   | 3     | 5                   |
| 2                                    | Number Systems and Codes         | 4     | 7                   |
| 3                                    | Arithmetic Logic Operations      | 5     | 9                   |
| 4                                    | Logic Gates and Boolean Function | 10    | 18                  |
| 5                                    | Logic Simplification             | 5     | 9                   |
| 6                                    | Combinational Logic Circuits     | 8     | 14                  |
| 7                                    | Sequential Logic Circuits        | 8     | 14                  |
| 8                                    | Digital Displays                 | 2     | 4                   |
| Total                                |                                  | 45    | 80                  |

\* There may be minor deviation in marks distribution.

### References:

1. M. Morris Mano, "Digital Logic Circuits and Computer Design", Prentice Hall Publication, 4<sup>th</sup> edition, 2013.
2. T. Flyod, "Digital Fundamentals", Pearson Publication, 11<sup>th</sup> edition, 2014.
3. Albert Paul Malvino (2006)," Principle of Digital Electronics", The Mc Graw Hill Companies
4. Ananda Kumar, "Fundamental of Digital Circuits", Prentice Hall –India, 2<sup>nd</sup> edition, 2013.

**PC Troubleshoot and Maintenance**  
EG2101IT

**Year: II**  
**Part: I**

**Total: 6 hours/week**  
**Lecture: 2 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: hours/week**  
**Lab: 3 hours/week**

**Course Description:**

This course deals with the fundamental concept, theories and popular principles of repair and maintenance of computer systems. The major focus is troubleshooting, repairing and maintenance of computer systems into real-life by utilizing the knowledge and skill of computer hardware and software.

**Course Objectives:**

At the end of the course student will be able to:

1. Explain basic operation and role of the computer.
2. Maintain the computer, its accessories and peripherals.
3. Take care of computer and its accessories against viruses and disasters.

**Course Contents:**

**Theory**

**Unit 1. Introduction to Troubleshoot** **[1 Hrs.]**

- 1.1. Definition of Troubleshoot
- 1.2. Troubleshooting Techniques

**Unit 2. System Case** **[1 Hrs.]**

- 2.1. Style and size
- 2.2. Form Factors
- 2.3. Switches
- 2.4. LEDs
- 2.5. Drive bay

**Unit 3. Power Supply** **[2 Hrs.]**

- 3.1. Ratings
- 3.2. Working Principle
- 3.3. Block Diagram
- 3.4. SMPS Concept
- 3.5. Troubleshoot various SMPS problems

**Unit 4. Mother Board and System Devices** **[2 Hrs.]**

- 4.1. Form factor
- 4.2. Parts
- 4.3. Chipset and controller
- 4.4. Buses
- 4.5. BIOS
- 4.6. Troubleshoot BIOS and memory problems in motherboard

**Unit 5. Basic Input Devices Troubleshoot** **[1 Hrs.]**

- 5.1. Keyboard
- 5.2. Mouse

- 5.3. Light pen
- 5.4. Other input devices

**Unit 6. Processor** **[3 Hrs.]**

- 6.1. Types of Processors
- 6.2. Generation of Processors
- 6.3. Frequency
- 6.4. Multi-Core Processors
- 6.5. Processor troubleshooting methods

**Unit 7. Storage Devices** **[6 Hrs.]**

- 7.1. Primary Storage Devices:
  - 7.1.1. RAM (Types, Speed, Access and Time, Size, Error Detection and Correction, Logical Memory Layout)
  - 7.1.2. ROM (PROM, EPROM, EEPROM)
  - 7.1.3. Cache Memory
  - 7.1.4. Flash Memory
- 7.2. Secondary Storage Devices:
  - 7.2.1. Hard disk (Brief History, Construction and Operation, Speed, Disk Geometry, Track, Cylinder and sectors, Capacity, Partitioning and Formatting, Interface IDE/ATA/SATA/SCSI, SSD)
  - 7.2.2. Tools for recovering data in HDD
  - 7.2.3. Compact Disc (CD/DVD/Blue-ray Disc, Color book Specification, Performance and Reliability, CD/R-W principle, interface)

**Unit 8. Monitors** **[3 Hrs.]**

- 8.1. Video modes, resolution, color and size
- 8.2. Monochromatic and color CRT
- 8.3. LCD/LED/plasma display

**Unit 9. Printers and UPS** **[3 Hrs.]**

- 9.1. Impact, non-impact printers
- 9.2. Troubleshoot printer problems
- 9.3. Introduction of UPS
- 9.4. Working Principle of UPS

**Unit 10. System Care** **[8 Hrs.]**

- 10.1. Preventive Maintenance
  - 10.1.1. General system care factors
  - 10.1.2. Cooling and Ventilation
  - 10.1.3. Power protection
  - 10.1.4. Data loss and virus protection
  - 10.1.5. System Restoration
- 10.2. Data problem detection
  - 10.2.1. Virus detection and protection
  - 10.2.2. Background of viruses
  - 10.2.3. Virus scanning and antivirus software
- 10.3. Backup and Disaster Recovery
  - 10.3.1. Risk of data
  - 10.3.2. Backup methods devices and media

- 10.3.3. Backup scheduling
- 10.3.4. Recovery of data

**Practical:**

**[45 Hrs.]**

**1. Identification and Selection of Required Tools**

**1.1 Physical Assembly procedure:**

- 1.1.1 Safety procedure, System case selection and preparation, layout of mother board, Secondary storage devices fitting and connections, Memory insertion, Power Connection, Processor and heat sink fitting, Connection of indicators and switches, Setting of jumpers, Insertion of peripheral cards like audio, NIC, Modem, Video Cards etc if necessary.

**2. Installation of Operating Systems:**

- 2.1 Management of Hard Disk (Partition and formatting), BIOS setup and installation of Operating system (Windows, Linux etc), Installation of Device drivers, Configuration, Installation of Application Programs and antivirus.

**3. Troubleshooting and Repairing Techniques:**

**3.1 During Initial hardware system setup-**

- 3.1.1 System Case, LEDs or Case Buttons, Key Lock, Power Sources and Power Protection Devices Cooling fans, air circulation, Motherboard and System Devices

**3.2 During Hardware Operations-**

- 3.2.1 General Failures, CMOS Memory or Real-Time Clock, System BIOS, Resources and Expansion Cards, Processor, System Memory, Memory Not Recognized, Out of Memory Problems, Performance Issues, Video Cards, Failure or Improper Operation, Image Quality Problems, Performance or Video Mode Issues, Monitors, Failure or Improper Operation, Hard Disk Drives, Booting or Operation Problems, Configuration Issues, Disk Compression Issues, Drive Letter Issues, File System Problems, Operating System, CD/DVD-ROM Drives, Drive Not Recognized, Configuration Problems, Audio Issues, Peripheral I/O Ports, Keyboards, Mice, Modems, Network Card,

**3.3 During Software Operation-**

- 3.3.1 Operation and Connection Problems, Speed Issues, Applications Program Failure, Virus Detection and Protection (Background of viruses, Virus scanning and Antivirus software), Disaster Recovery (Risk of data, Backup methods devices and media, Backup scheduling, Recovery of data)

| Final written exam evaluation scheme |                                  |       |                     |
|--------------------------------------|----------------------------------|-------|---------------------|
| Unit                                 | Title                            | Hours | Marks Distribution* |
| 1                                    | Introduction to Troubleshoot     | 1     | 1                   |
| 2                                    | System Case                      | 1     | 1                   |
| 3                                    | Power Supply                     | 2     | 3                   |
| 4                                    | Mother Board and System Devices  | 2     | 3                   |
| 5                                    | Basic Input Devices Troubleshoot | 1     | 1                   |
| 6                                    | Processor                        | 3     | 4                   |
| 7                                    | Storage Devices                  | 6     | 8                   |
| 8                                    | Monitors                         | 3     | 4                   |

|    |                  |           |           |
|----|------------------|-----------|-----------|
| 9  | Printers and UPS | 3         | 4         |
| 10 | System Care      | 8         | 11        |
|    | <b>Total</b>     | <b>30</b> | <b>40</b> |

\* There may be minor deviation in marks distribution.

#### **References:**

1. Win Rosch, The hardware Bible 3<sup>rd</sup> Edition
2. Peter Norton, Introduction to Computers 4<sup>th</sup> Edition
3. Mark Minasi, The Complete PC Upgrade and Maintenance Guide
4. Scott Mueller, Upgrading and Repairing PCs

**Basic Electrical and Electronics Engineering**  
EG2106CT

**Year: II**  
**Part: I**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: ... hours/week**  
**Lab: 3 hours/week**

**Course description:**

This course is designed to understand fundamental concept of electric and electronic circuits.

**Course objectives:**

After completion of this course students will be able to:

1. Differentiate between active and passive elements and circuits.
2. Identify and explain the working principle of electric circuits.
3. Identify and explain the working principle of electronic circuits.

**Course Contents:**

**Theory**

**Unit 1. Basic Electric System** **[6 Hrs.]**

- 1.1. Constituent parts of an electric system (Source, Load, Communication and Control)
- 1.2. Current flow in a circuit
- 1.3. Electromotive Force and Potential Difference
- 1.4. Electrical Units
- 1.5. Passive Components: Resistance, Inductance & Capacitance, Series and Parallel Combinations
- 1.6. Voltage and Current Sources: Independent, Dependent, VCVS, VCCS, CCCS, C CVS
- 1.7. Ohm's Law
- 1.8. Temperature rise and Temperature Coefficient of Resistance

**Unit 2. DC Circuits and Network Theorems** **[6 Hrs.]**

- 2.1. Power and Energy
- 2.2. Kirchhoff's Law and Its Application: Nodal Analysis and Mesh Analysis
- 2.3. Star – Delta and Delta – Star Transformation
- 2.4. Superposition Theorem
- 2.5. Thevenin's Theorem
- 2.6. Norton's Theorem
- 2.7. Maximum Power Transfer Theorem
- 2.8. Reciprocity Theorem

**Unit 3. Alternating Quantities** **[4 Hrs.]**

- 3.1. AC system
- 3.2. Waveform, Terms and Definitions
- 3.3. Average and rms values of Current and Voltage
- 3.4. Phasor Representation

**Unit 4. Single – Phase AC Circuits** **[4 Hrs.]**

- 4.1. AC in Resistive Circuits
- 4.2. Current and Voltage in an Inductive circuit

- 4.3. Current and Voltage in an Capacitive circuit
- 4.4. Concept of Complex Impedance and Admittance
- 4.5. AC Series and Parallel Circuits
- 4.6. RL, RC and RLC Circuit Analysis and Phasor Representation

**Unit 5. Power in AC Circuits** **[5 Hrs.]**

- 5.1. Power in Resistive Circuits
- 5.2. Power in Inductive and Capacitive Circuits
- 5.3. Power in Circuits with Resistance and Reactance
- 5.4. Active and Reactive Power: Power Factor, Importance and Measurement of Power Factor

**Unit 6. Diode** **[6 Hrs.]**

- 6.1. Conductor, Insulator and Semiconductor
- 6.2. Types of Semiconductors: Intrinsic and Extrinsic, P type and N type
- 6.3. Semiconductor Diode Characteristics
- 6.4. Diode Circuits: Clipper and Clamper Circuits
- 6.5. Zener Diode, LED, Photodiode, Varacter Diode, Tunnel Diode
- 6.6. DC Power Supply: Rectifier (Half – Wave and Full - Wave), Zener Regulated Power Supply

**Unit 7. Transistor** **[6 Hrs.]**

- 7.1. BJT: Types, Configurations, Modes of Operations, Working Principle
- 7.2. Biasing of BJT
- 7.3. BJT as an Amplifier and a Switch
- 7.4. Small and Large Signal Models
- 7.5. BJT as Logic Gates
- 7.6. Concept of Differential Amplifier using BJT

**Unit 8. MOSFET** **[4 Hrs.]**

- 8.1. Types and Construction of MOSFET
- 8.2. Working Principle of MOSFET
- 8.3. Biasing of MOSFET
- 8.4. Construction and working of CMOS
- 8.5. MOSFET and CMOS as Logic Gates

**Unit 9. The Operational Amplifier (Op - Amp)** **[4 Hrs.]**

- 9.1. Basic Model, Ideal and Real Characteristics, Virtual Ground Concept
- 9.2. Inverting and Non – Inverting Mode Amplifier
- 9.3. Some Applications: Summing Amplifier, Differentiator, Integrator, Comparator

**Practical:** **[45 Hrs.]**

- 1. Measurement of Voltage, Current and Power in DC Circuits
  - a) Verification of Ohm's Law
  - b) Temperature Effect in Resistance
- 2. Kirchhoff's Current and Voltage Law
  - a) Evaluate Power from V and I
  - b) Note Loading Effects in Meters
- 3. Measurement of Amplitude, Frequency and Time in Oscilloscope
  - a) Calculate and Verify Average and rms Values

- b) Examine Phase Relation in RL and RC Circuits
- 4. Measurement of Alternating Quantities
  - a) R, RL, RC Circuits with AV Excitation
  - b) AC Power, Power Factor, Phasor Diagram
- 5. Diode Characteristics, Rectifiers and Zener Diode
- 6. BJT Characteristics
- 7. MOSFET Characteristics
- 8. Voltage Amplifier using OP – Amp, Comparators

| <b>Final written exam evaluation scheme</b> |                                      |              |                            |
|---------------------------------------------|--------------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                         | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Basic Electric System                | 6            | 10                         |
| 2                                           | DC Circuits and Network Theorems     | 6            | 10                         |
| 3                                           | Alternating Quantities               | 4            | 8                          |
| 4                                           | Single – Phase AC Circuits           | 4            | 8                          |
| 5                                           | Power in AC Circuits                 | 5            | 8                          |
| 6                                           | Diode                                | 6            | 10                         |
| 7                                           | Transistor                           | 6            | 10                         |
| 8                                           | MOSFET                               | 4            | 8                          |
| 9                                           | The Operational Amplifier (Op - Amp) | 4            | 8                          |
|                                             | <b>Total</b>                         | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

#### **References:**

1. B. L. Theraja and A. K. Theraja, “A Textbook on Electrical Technology”, S Chand, Latest Edition
2. J. R. Cogdell, “Foundations of Electrical Engineering”, Prentice Hall, Latest Edition
3. J. B. Gupta, “A Textbook on Electrical Technology”, Katson, Latest Edition
4. A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, Latest Edition
5. Thomas L. Floyd, “Electronic Devices”, Pearson Education, Latest Edition

**Second Year/ Second Part**

| <b>S.N.</b> | <b>Course Code</b> | <b>Subject</b>                           |
|-------------|--------------------|------------------------------------------|
| 1           | EG2201CT           | Database Management System               |
| 2           | EG2202CT           | Data Structure and Algorithm             |
| 3           | EG2203CT           | Object Oriented Programming in Java      |
| 4           | EG2204CT           | Microprocessor and Computer Architecture |
| 5           | EG2205CT           | Web Technology II                        |
| 6           | EG2206CT           | Statistics and Probability               |

**Database Management System**  
EG2201CT

**Year: II**  
**Part: II**

**Total: 6 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hours/week**  
**Practical: hours/week**  
**Lab: 2 hours/week**

**Course description:**

This course covers the core principles and techniques required in the design and implementation of database systems. It consists of relational database systems RDBMS - the predominant system for business, scientific and engineering applications at present, Entity-Relational model, Normalization, Relational model, Relational algebra, and data access queries as well as an introduction to SQL. It also covers essential DBMS concepts such as: Transaction Processing, Concurrency Control and Recovery.

**Course objectives:**

The main objectives of this course are:

1. Explain the concepts of database and database management system.
2. Provide knowledge of database design using entity relationship diagram.
3. Perform on SQL statements, normalization, transaction processing, and database recovery

**Course Contents:**

**Theory**

**Unit 1. Introduction** **[5 Hrs.]**

- 1.1. History, Database and its applications
- 1.2. Characteristics
- 1.3. Architecture
- 1.4. Data abstraction and Independence
- 1.5. Schemas and Instances
- 1.6. Classifications of DBMS
- 1.7. Introduction to DDL, DML, DCL

**Unit 2. Data Models** **[8 Hrs.]**

- 2.1. Introduction to Entity Relationship Model
- 2.2. Entities type
- 2.3. Entities Set
- 2.4. Attributes and keys
- 2.5. Relationship types and sets
- 2.6. E-R diagrams

**Unit 3. Normalization** **[6 Hrs.]**

- 3.1. Importance of Normalization
- 3.2. Functional Dependencies
- 3.3. Integrity and Domain constraints
- 3.4. Normal forms (1NF, 2NF, 3NF, BCNF)

**Unit 4. Relational Language** **[8 Hrs.]**

- 4.1. Introduction to SQL
- 4.2. Features of SQL

- 4.3. Basic Retrieval queries
- 4.4. INSERT, UPDATE, DELETE queries
- 4.5. Join, Semi join and Sub queries
- 4.6. Views
- 4.7. Relational Algebra
  - 4.7.1. Select, Project
  - 4.7.2. Set Operations
  - 4.7.3. Cartesian Product
  - 4.7.4. Join

**Unit 5. Query Processing** **[6 Hrs.]**

- 5.1. Introduction to Query Processing
- 5.2. Query Cost estimation
- 5.3. Query Operations, Operator TREE
- 5.4. Evaluation of Expressions
- 5.5. Query Optimization
- 5.6. Performance Tuning

**Unit 6. Transaction and Concurrency Control** **[6 Hrs.]**

- 6.1. Introduction to Transaction
- 6.2. Serializability concept
- 6.3. Concurrent execution
- 6.4. Lock based Concurrency Control
- 6.5. 2PL and Strict 2PL
- 6.6. Timestamp concept

**Unit 7. Recovery** **[6 Hrs.]**

- 7.1. Failure Classifications
- 7.2. Recovery and Atomicity
- 7.3. IN PLACE and Out of Place Update
- 7.4. Log based Recovery
- 7.5. Shadow Paging
- 7.6. Local Recovery Manager
- 7.7. UNDO and REDO protocol

**Practical:** **[30 Hrs.]**

- 1. SQL Queries on CREATE, INSERT, DELETE, and UPDATE operations.
- 2. SQL query for SELECT operation.
- 3. SQL query for ALTER operations.
- 4. SQL queries on JOIN
- 5. SQL query using aggregate functions.
- 6. Apply SQL for specifying constraints.

| Final written exam evaluation scheme |                     |       |                     |
|--------------------------------------|---------------------|-------|---------------------|
| Unit                                 | Title               | Hours | Marks Distribution* |
| 1                                    | Introduction        | 5     | 8                   |
| 2                                    | Data Model          | 8     | 14                  |
| 3                                    | Normalization       | 6     | 11                  |
| 4                                    | Relational Language | 8     | 14                  |
| 5                                    | Query Processing    | 6     | 11                  |

|   |                                     |           |           |
|---|-------------------------------------|-----------|-----------|
| 6 | Transaction and Concurrency Control | 6         | 11        |
| 7 | Recovery                            | 6         | 11        |
|   | <b>Total</b>                        | <b>45</b> | <b>80</b> |

\* There may be minor deviation in marks distribution.

#### **References:**

1. Silberschatz, H.F. Korth, and S. Sudarshan (2010), Database System Concepts, 6th Edition, McGraw Hill
2. Ramez Elmasri and Shamkant B. Navathe (2010), Fundamentals of Database Systems, 6 th Edition, Pearson Addison Wesley
3. Raghu Ramakrishnan, and Johannes Gehrke (2007), Database Management Systems, 3rd Edition, McGraw-Hill
4. Jaffrey D. Ullman, Jennifer Widom; A First Course in Database Systems; Third Edition; Pearson Education Limited

## Data Structure and Algorithm

EG2202CT

**Year: II**  
**Part: II**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: hour/week**  
**Lab: 3 hours/week**

### **Course Description:**

The purpose of this course is to provide the students with the basic concepts of data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that might occur. This course offers the students a mixture of theoretical knowledge and practical experience.

### **Course Objectives:**

On completion of this course the students will be enabled to:

1. Introduce data abstraction and data representation in memory.
2. Discuss, design and use elementary data structures such as stack, queue, linked list, tree and graph.
3. Decompose complex programming problems into manageable sub-problems.
4. Introduce theory of algorithms and their complexity.

### **Course Contents:**

#### **Theory**

#### **Unit 1. Introduction** **[2 Hrs.]**

- 1.1. Algorithm and its types
- 1.2. Data structure and its types
- 1.3. Tools for algorithm analysis (Big O Notation)
  - 1.3.1. Type of analysis: Time and space complexity
  - 1.3.2. Asymptotic Notations: Big- O, Big- $\Omega$  and Big- $\theta$

#### **Unit 2. Stack and Queue** **[6 Hrs.]**

- 2.1. Stack and Operation
  - 2.1.1. Continuous implementation of Stack with varying and fixed TOS
- 2.2. Application of Stack
  - 2.2.1. Converting Infix to Post fix expression
  - 2.2.2. Evaluating Post Fix expression
- 2.3. Queue and Operation
  - 2.3.1. Definition
  - 2.3.2. Algorithm of Enqueue and dequeue
  - 2.3.3. Linear Queue
  - 2.3.4. Circular Queue
  - 2.3.5. Priority Queue
  - 2.3.6. Applications of Queue

#### **Unit 3. List** **[8 Hrs.]**

- 3.1. Definition and Structure of link list
- 3.2. Advantage and disadvantages of link list
- 3.3. Operations in Singly Linked list

- 3.3.1. Insertion at the beginning and end, after the node, before the node
- 3.3.2. Deletion at the beginning and end, after the node, before the node
- 3.4. Doubly linked list
  - 3.4.1. Definition
  - 3.4.2. Structure of doubly linked list
  - 3.4.3. Insertion at the beginning and end, after the node, before the node
  - 3.4.4. Deletion at the beginning and end, after the node, before the node
  - 3.4.5. Advantages and disadvantages

**Unit 4. Recursion** **[3 Hrs.]**

- 4.1. Properties of recursion
- 4.2. Recursion vs Iteration
- 4.3. TOH and its solution
- 4.4. Solution of Fibonacci sequence and factorial

**Unit 5. Trees** **[6 Hrs.]**

- 5.1. Tree concepts
- 5.2. Binary tree
- 5.3. Application of binary tree
- 5.4. Node representation
- 5.5. Operation in Binary Tree
  - 5.5.1. Insertion
  - 5.5.2. Deletion
- 5.6. Algorithm of tree search
- 5.7. Tree traversals
  - 5.7.1. Pre order
  - 5.7.2. In order
  - 5.7.3. Post order
- 5.8. Height, level and depth of tree and its importance
- 5.9. AVL balance tree
  - 5.9.1. Definition
  - 5.9.2. Detection of unbalance
  - 5.9.3. Single and double rotation in balancing

**Unit 6. Sorting** **[6 Hrs.]**

- 6.1. Definition
- 6.2. Types of sorting (Internal and external)
- 6.3. Algorithm of Bubble sort
- 6.4. Algorithm of Insertion sort
- 6.5. Algorithm of Selection sort
- 6.6. Algorithm for Quick sort
- 6.7. Algorithm for Merge sort
- 6.8. Algorithm for Heap sort

**Unit 7. Search** **[7 Hrs.]**

- 7.1. Sequential search
- 7.2. Binary search
- 7.3. Tree search algorithm
- 7.4. Hashing

- 7.4.1. Definition
- 7.4.2. Hash function and hash table
- 7.4.3. Collision in Hashing
- 7.4.4. Collision Resolution Techniques ( Open and Closed)

## Unit 8. Graph

[7 Hrs.]

- 8.1. Components of Graph
- 8.2. Directed and Undirected
- 8.3. Connected and Unconnected
- 8.4. Path and Cycle
- 8.5. Adjacency sets and tables
- 8.6. Array based representation
- 8.7. Linked based and mixed implementation
- 8.8. Minimum Spanning Trees:
  - 8.8.1. Kruskal's Algorithms and prim's algorithm
  - 8.8.2. Algorithm of graph traversal (Depth First traversal, Breadth First traversal)
  - 8.8.3. Shortest path algorithm

## Practical:

[45 Hrs.]

- 1. Implement stack using array
- 2. Implement linear and circular queue
- 3. Solve TOH & Fibonacci sequence using recursion
- 4. Implement linked list: singly and doubly
- 5. Perform basic operations on a binary tree data structure.
- 6. Implement binary search using function and without function.
- 7. Implement Hashing for handling the collision.

| Final written exam evaluation scheme |                 |           |                     |
|--------------------------------------|-----------------|-----------|---------------------|
| Unit                                 | Title           | Hours     | Marks Distribution* |
| 1.                                   | Introduction    | 2         | 4                   |
| 2.                                   | Stack and Queue | 6         | 11                  |
| 3.                                   | List            | 8         | 14                  |
| 4.                                   | Recursion       | 3         | 5                   |
| 5.                                   | Trees           | 6         | 11                  |
| 6.                                   | Sorting         | 6         | 11                  |
| 7.                                   | Search          | 7         | 12                  |
| 8.                                   | Graph           | 7         | 12                  |
|                                      | <b>Total</b>    | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

## References:

- 1. Agarwal, U. (2012). Data Structure Using C. (3rd ed.). S K Katari & Sons.
- 2. Tenenbaum, A.M, Langsam, Y & Auguestein, M.J. (1996). Data Structure Using C and C++. (2nd ed.). India: Prentice Hall India.
- 3. Sahni, S. (2002). Data Structures, Algorithms and Applications in C++. (2nd ed.). India: University Press

## **Object-Oriented Programming in Java**

EG2203CT

**Year: II**  
**Part: II**

**Total: 8 hours /week**  
**Lecture: 4 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: hour/week**  
**Lab: 3 hours/week**

### **Course description:**

The purpose of this course is to introduce the concepts Object Oriented Programming using Java programming including introduction, basic structure, classes and objects, inheritance, interfaces, packages, exception handling, and multithreading. At the end, students will be able to write computer programs using different features of Java Programming.

### **Course objectives:**

After completion of this course students will be able to:

1. Implement the concept of Object-Oriented Programming.
2. Implement object, class, inheritance, polymorphism, encapsulation and data abstraction in programming.
3. Implement the problems in Java using Object-Oriented approach.

### **Course Contents:**

#### **Theory**

#### **Unit 1. Object-Oriented Programming [3 Hrs.]**

- 1.1. Procedure Oriented Programming
- 1.2. Object-Oriented Programming
- 1.3. Procedure Oriented versus Object Oriented Programming
- 1.4. OOP principles
- 1.5. Advantages and Disadvantages of OOP

#### **Unit 2. Introduction to Java [2 Hrs.]**

- 2.1. Java as a Programming Platform
- 2.2. History of Java
- 2.3. Java Buzzwords
- 2.4. Java Virtual Machine

#### **Unit 3. Fundamental Programming Structures [10 Hrs.]**

- 3.1. Whitespace, Identifiers, Literals, Comments, Separators and Keywords
- 3.2. Data Types and Conversion
- 3.3. Variables
- 3.4. Constants
- 3.5. Operators
- 3.6. Strings
- 3.7. Control Structures
- 3.8. Loop
- 3.9. Methods
- 3.10. Arrays

#### **Unit 4. Classes and Objects [10 Hrs.]**

- 4.1. Defining Class
- 4.2. Adding Variables

- 4.3. Adding Methods
- 4.4. Static Variables, Methods, Blocks and Class
- 4.5. Access Control
- 4.6. Method Parameters
- 4.7. Creating Objects
- 4.8. Accessing class members
- 4.9. Setters and Getters
- 4.10. Constructors
- 4.11. Overloading Methods
- 4.12. Call by value, Call by reference
- 4.13. this keyword
- 4.14. final modifier
- 4.15. Nested Classes
- 4.16. Wrapper Classes in Java
- 4.17. Garbage Collection

#### **Unit 5. Inheritance**

**[8 Hrs.]**

- 5.1. Introduction
- 5.2. Types of Inheritance
- 5.3. Method Overriding
- 5.4. Using Super keyword
- 5.5. Execution of Constructors in Multilevel Inheritance
- 5.6. Abstract Classes and Methods

#### **Unit 6. Interface and package**

**[8 Hrs.]**

- 6.1. Defining Interfaces
- 6.2. Extending Interfaces
- 6.3. Implementing Interfaces
- 6.4. Accessing Interface Variables
- 6.5. Introduction to java Packages
- 6.6. Creating a Package and naming convention
- 6.7. Using Packages

#### **Unit 7. Exception Handling**

**[6 Hrs.]**

- 7.1. Exceptions and its types
- 7.2. Exception handling fundamentals (try, catch, throw, throws and finally)
- 7.3. Using try and catch
- 7.4. Using throw and throws

#### **Unit 8. Multithreading**

**[6 Hrs.]**

- 8.1. Introduction of Thread
- 8.2. Creating a Thread
- 8.3. Thread Priorities
- 8.4. Life cycle of a Thread (Thread states)

#### **Unit 9. I/O**

**[7 Hrs.]**

- 9.1. Java.io package
- 9.2. Byte Stream and Character Stream classes
- 9.3. Using FileInputStream and FileOutputStream classes
- 9.4. Using FileReader and FileWriter Classes

**Practical:****[45 Hrs.]**

1. Install Java Tools.
2. Create and demonstrate programs using control statements and array.
3. Create and demonstrate programs using class, object, methods and constructor.
4. Create and demonstrate programs using inheritance.
5. Create and demonstrate programs using method overloading and method overriding.
6. Create and import Java Packages and Sub-Packages.
7. Create and demonstrate programs using interface.
8. Create and demonstrate programs for exception handling.
9. Create and demonstrate programs for concept of multithreading.
10. Create and demonstrate I/O programs.

| Final written exam evaluation scheme |                                    |           |                     |
|--------------------------------------|------------------------------------|-----------|---------------------|
| Unit                                 | Title                              | Hours     | Marks Distribution* |
| 1                                    | Object-Oriented Programming        | 3         | 4                   |
| 2                                    | Introduction to Java               | 2         | 3                   |
| 3                                    | Fundamental Programming Structures | 10        | 13                  |
| 4                                    | Classes and Objects                | 10        | 13                  |
| 5                                    | Inheritance                        | 8         | 11                  |
| 6                                    | Interface and package              | 8         | 11                  |
| 7                                    | Exception Handling                 | 6         | 8                   |
| 8                                    | Multithreading                     | 6         | 8                   |
| 9                                    | I/O and Java Applets               | 7         | 9                   |
|                                      | <b>Total</b>                       | <b>60</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

**References:**

1. Balaguruswamy, E. (2014). *Programming with JAVA - A Primer: Third Edition*. McGraw-Hill Professionals.
2. David Holmes, K. A. (2005). *THE Java™ Programming Language, Fourth Edition*. Addison-Wesley Professional.
3. Horstmann, C. S. (2018). *Core Java Volume I--Fundamentals*. Pearson.
4. M. T. SOMASHEKARA, D. S. (2017). *OBJECT ORIENTED PROGRAMMING WITH JAVA*. PHI Learning Pvt. Ltd.
5. Mohan, P. (2013). *Fundamentals of Object-Oriented Programming in Java*. CreateSpace Independent Publishing Platform.

**Microprocessor and Computer Architecture**  
EG2204CT

**Year: II**  
**Part: II**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: ... hours/week**  
**Lab: 3 hours/week**

**Course description:**

This course is designed to explore architecture of a microprocessor and its programming in assembly language. The student will be able to apply logics to various given problems and develop programs using assembly language construct that would help them to develop real time microprocessor-based application programs. This course also includes the concept of instruction set architecture, organization or micro architecture and concepts of computer arithmetic.

**Course objectives:**

After completion of this course students will be able to:

1. Discuss the architecture of 8085 microprocessor and assembly language programming.
2. Demonstrate the basic structure and operation of digital computer.
3. Explain microprogrammed control unit.
4. Explore the concept of pipelining.
5. Discuss data and algorithm used to perform operations on data.

**Course Contents:**

**Theory**

**Unit 1. Introduction of Microprocessor** **[8 Hrs.]**

- 1.1. Evolution of microprocessor and its types
- 1.2. Microprocessor Bus organization: Data Bus, Address Bus and Control Bus
- 1.3. Operations of microprocessor: internal data manipulation, microprocessor initiated and peripheral or external initiated
- 1.4. Pin diagram and internal Architecture of 8085
- 1.5. Internal registers organization of 8085
- 1.6. Limitations of 8085

**Unit 2. Instruction Cycle and Timing Diagram** **[3 Hrs.]**

- 2.1. 8085 machine cycles
- 2.2. Bus timings to fetch, decode, execute instruction from memory
- 2.3. Memory read and write
- 2.4. Input/output read and write cycle with timing diagram

**Unit 3. 8085 Instruction set** **[12 Hrs.]**

- 3.1. Machine language instruction format:
  - 3.1.1. Single byte
  - 3.1.2. Two bytes
  - 3.1.3. Three-byte instructions
- 3.2. Various addressing modes
- 3.3. Data transfer operation and instruction
- 3.4. Arithmetic operation and instruction
- 3.5. Logical operation and instruction

- 3.6. Branch operation and instruction
- 3.7. Stack operation and instruction
- 3.8. Input/output and machine control operation and instruction
- 3.9. Simple programs with 8085 instructions

#### **Unit 4. Basic Computer Architecture**

**[4 Hrs.]**

- 4.1. Introduction
  - 4.1.1. History of Computer Architecture
  - 4.1.2. Overview of Computer Organization
  - 4.1.3. Memory Hierarchy and cache
- 4.2. Instruction Codes
- 4.3. Stored Program Organization
- 4.4. Indirect address, computer registers
- 4.5. Common Bus system
- 4.6. Instruction sets
- 4.7. Instruction types

#### **Unit 5. Design of Microprogrammed Control Unit**

**[10 Hrs.]**

- 5.1. Control Word, Microprogram, Control Memory
- 5.2. Control Address Register, Sequencer
- 5.3. Address Sequencing
- 5.4. Conditional Branch
- 5.5. Mapping of Instructions
- 5.6. Subroutines, Microinstruction Format, Symbolic Microinstructions
- 5.7. Central Processing Unit
  - 5.7.1. Introduction
  - 5.7.2. General Register Organization
  - 5.7.3. Stack Organization
- 5.8. Instruction Formats
- 5.9. Addressing Modes.
- 5.10. RISC vs CISC.
- 5.11. Pipeline and Vector Processing
  - 5.11.1. Arithmetic and Instruction pipeline
  - 5.11.2. Vector operations
  - 5.11.3. Matrix Multiplication, memory interleaving

#### **Unit 6. Computer Arithmetic**

**[ 3 Hrs.]**

- 6.1. Data Representation
  - 6.1.1. Fixed point Representation
  - 6.1.2. Floating point Representation
- 6.2. Addition and Subtraction with Signed Magnitude Data
- 6.3. Addition and Subtraction with Signed 2's Complement Data
- 6.4. Multiplication of Signed Magnitude Data
- 6.5. Booth Multiplication

#### **Unit 7. Input Output Organization**

**[ 5 Hrs.]**

- 7.1. Input-Output Interface
  - 7.1.1. I/O Bus and Interface Modules
  - 7.1.2. I/O vs. Memory Bus
  - 7.1.3. Isolated vs. Memory-Mapped I/O

- 7.2. Asynchronous Data Transfer: Strobe, Handshaking
- 7.3. Modes of Transfer:
  - 7.3.1. Programmed I/O
  - 7.3.2. Interrupt-Initiated I/O
  - 7.3.3. Direct memory Access
- 7.4. Direct Memory Access, Input-Output Processor, DMA vs. IOP

**Practical:**

**[45 Hrs.]**

1. Demonstrate 8085 using kit/simulator.
2. Implement program to perform arithmetic operations (Add, subtract, multiply and divide) on signed and unsigned two 8-bit numbers.
3. Implement a program to mask the lower four bits of content of the memory location.
4. Implement a program to set higher four bits of content of the memory location to 1.
5. Implement a program to perform Exclusive OR of two numbers.
6. Implement a program to exchange the content of two memory locations.
7. Implement program to add/subtract 16-bit numbers
8. Implement program to copy content of one memory location to another memory location.
9. Implement a program to check whether given no is odd or even.
10. Implement a program to count no of zero value in given block of data.
11. Implement algorithms for computer arithmetic using high level language like C or C++

| <b>Final written exam evaluation scheme</b> |                                        |              |                            |
|---------------------------------------------|----------------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                           | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Introduction of Microprocessor         | 8            | 14                         |
| 2                                           | Instruction Cycle and Timing Diagram   | 3            | 5                          |
| 3                                           | 8085 Instruction set                   | 12           | 22                         |
| 4                                           | Basic Computer Architecture            | 4            | 7                          |
| 5                                           | Design of Microprogrammed Control Unit | 10           | 18                         |
| 6                                           | Computer Arithmetic                    | 3            | 5                          |
| 7                                           | Input Output Organization              | 5            | 9                          |
|                                             | <b>Total</b>                           | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

**References:**

1. Stallings W, Computer Organization and Architecture, 4th Edition, Prentice Hall of India Private Limited.
2. Malvino A.P., Brown J.A., Digital Computer Electronics, 3rd Edition, Tata McGraw Hill Hall
3. D.V, Microprocessors and Interfacing– Programming and Hardware, McGraw Hill
4. Gaonkar R, Microprocessor Architecture, Programming, and application with 8085, Penram International Publication

**Web Technology II**  
EG2205CT

**Year: II**  
**Part: II**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: hours/week**  
**Lab: 3 hours/week**

**Course description:**

The purpose of this course is to introduce the concepts of Web Technology using PHP programming including introduction, basic structure, classes and objects, inheritance and exception handling. This course also helps to implement database connectivity and manipulation, XML, AJAX and PHP framework. At the end, students will be able to design and develop dynamic web contents and applications.

**Course objectives:**

After completion of this course students will be able to:

1. Implement PHP for the basic of server-side scripting language
2. Apply PHP and MySQL for the fundamentals of database, database design and their uses in web programming
3. Use XML, AJAX and Content Management Systems

**Course Contents:**

**Theory**

**Unit 1. Web Server Concept** **[5 Hrs.]**

- 1.1. Introduction to Web Server
- 1.2. Architecture of web server
- 1.3. Concept of Dynamic Content
- 1.4. Using control flow to control dynamic content generation
- 1.5. Concept of Architecting Web Application

**Unit 2. Review of Database: MySQL** **[4 Hrs.]**

- 2.1. Introduction to MySQL
- 2.2. MySQL queries
  - 2.2.1. Create
  - 2.2.2. Insert
  - 2.2.3. Select
  - 2.2.4. Update
  - 2.2.5. Delete
  - 2.2.6. Alter
- 2.3. Database Normalization

**Unit 3. Server-Side Script: PHP** **[12 Hrs.]**

- 3.1. Introduction of PHP
- 3.2. Advantage of using PHP for web development
- 3.3. PHP Installation
- 3.4. PHP Syntax
- 3.5. Comments, Variable, Operators, Datatype, Strings, Keywords
- 3.6. Conditional Statements
- 3.7. Loop
- 3.8. Arrays

- 3.9. Functions
- 3.10. Passing variables with data between pages
  - 3.10.1. Get & Post Method
  - 3.10.2. Cookies
  - 3.10.3. Sessions
- 3.11. File Upload: Date, Include, File, File Upload
- 3.12. Accessing Form Elements, Form Validation
- 3.13. Exception and Error Handling

**Unit 4. Object oriented concept and Database Connectivity [8 Hrs.]**

- 4.1. Classes and Objects
- 4.2. Access Modifiers
- 4.3. Constructors and Destructors
- 4.4. Inheritance and Scope
- 4.5. Overwriting Methods
- 4.6. Database Connectivity
  - 4.6.1. Creating database with Server-Side Script
  - 4.6.2. Connecting Server-Side Script to Database
  - 4.6.3. Multiple Connections
  - 4.6.4. Making queries
  - 4.6.5. Building in Error Checking
  - 4.6.6. Fetching Data sets
  - 4.6.7. Displaying Queries in tables
  - 4.6.8. Building Forms and control form data using queries

**Unit 5. AJAX and eXtensible Markup Language (XML) [8 Hrs.]**

- 5.1. Basic concept of AJAX
- 5.2. Features of XML
- 5.3. Structure of XML: Logical Structure, Physical Structure
- 5.4. Naming Rules
- 5.5. XML Elements
- 5.6. XML Attributes
- 5.7. Element Content Models: Element Sequences i.e., <!ELEMENT counting (first, second, third, fourth)>, Element Choices <!ELEMENT choose (this.one | that.one)>, Combined Sequences and Choices
- 5.8. Element Occurrence Indicators: -Discussion of Three Occurrence Indicators? (Question Mark) \* (Asterisk Sign) + (Plus Sign)
- 5.9. XML schema languages: Document Type Definition (DTD), XML Schema Definition (XSD)
- 5.10. XML Style Sheets (XSLT)

**Unit 6. PHP Framework [8 Hrs.]**

- 6.1. Introduction
- 6.2. Features
- 6.3. Basic DB & Client-Side Validation
- 6.4. Session & Email System
- 6.5. Framework with method, Classes and Cookies

**Practical: [45 Hrs.]**

1. Installing required software and platforms for local servers and scripting (IDE, XAMPP, WAMPP, LAMPP etc.)
2. Simple programs using;
  - 2.1 Control and loops
  - 2.2 Strings
  - 2.3 Arrays
  - 2.4 Functions
3. Passing Information between pages
4. Forms handling, validation etc.
5. Writing to file, reading from file and file upload
6. Examples of sessions and cookies
7. Connecting to database
8. Using various queries on database to extract, insert, update and delete from the web interface
9. Using XML markup elements and its attributes
10. Concept of using simple AJAX in webpage
11. Design and develop a dynamic web page which should include database

| Final written exam evaluation scheme |                                                   |           |                     |
|--------------------------------------|---------------------------------------------------|-----------|---------------------|
| Unit                                 | Title                                             | Hours     | Marks Distribution* |
| 1                                    | Web Server Concept                                | 5         | 10                  |
| 2                                    | Review of database: MySQL                         | 4         | 8                   |
| 3                                    | Server-Side Script: PHP                           | 12        | 20                  |
| 4                                    | Object oriented concept and Database Connectivity | 8         | 14                  |
| 5                                    | AJAX and eXtensible Markup Language (XML)         | 8         | 14                  |
| 6                                    | PHP Web Design Framework                          | 8         | 14                  |
|                                      | <b>Total</b>                                      | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

#### References:

1. Bayross “*Web Enabled Commercial Application Development Using HTML, DHTML, JavaScript, PHP*” BPB Publication
2. Hornberger Allen, “*Mastering in PHP*”, BPB Publication
3. Converse and Park with Morgan “*PHP MYSQL Bible*” WILEY Publication
4. Sybex “*ASP, ADO and XML Complete*” BPB Publication
5. Russell “*Mastering Active Server Pages*” (BPB)

**Statistics and Probability**  
EG2206CT

**Year: II**  
**Part: II**

**Total: 4 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: hours/week**  
**Lab: hours/week**

**Course description:**

This course deals with a practical knowledge of the principles and concept of probability and statistics and their application to simple engineering problems.

**Course objectives:**

After completion of this course students will be able to:

1. Explain the principles and concept of probability.
2. Apply statistics to solve simple engineering problems.

**Course Contents:**

**Theory**

|                                                                  |                 |
|------------------------------------------------------------------|-----------------|
| <b>Unit 1. Introduction of Statistics</b>                        | <b>[3 Hrs.]</b> |
| 1.1. Origin and development of statistics                        |                 |
| 1.2. Definition of statistics                                    |                 |
| 1.3. Importance and scope of statistics                          |                 |
| 1.4. Limitation of statistics                                    |                 |
| <b>Unit 2. Collection of data.</b>                               | <b>[3 Hrs.]</b> |
| 2.1. Data, types of data                                         |                 |
| 2.2. Methods of collecting primary data                          |                 |
| 2.3. Sources of secondary data                                   |                 |
| <b>Unit 3. Classification and Tabulation</b>                     | <b>[3 Hrs.]</b> |
| 3.1. Classification of data                                      |                 |
| 3.2. Meaning and Importance of table                             |                 |
| 3.3. Parts of table                                              |                 |
| <b>Unit 4. Diagrammatic and graphic representation</b>           | <b>[4 Hrs.]</b> |
| 4.1. Difference between diagram and graphs                       |                 |
| 4.2. Bar diagram and its type                                    |                 |
| 4.3. Histogram and pie diagram                                   |                 |
| 4.4. Graphical representation of data                            |                 |
| 4.5. Limitation of diagrams and graphs                           |                 |
| <b>Unit 5. Summarizing a Data set</b>                            | <b>[8 Hrs.]</b> |
| 5.1. Introduction                                                |                 |
| 5.2. Measures of central tendency (Mean, Median, Mode, G.M, S.M) |                 |
| 5.3. Partition values (quartiles, deciles, percentiles)          |                 |
| 5.4. Measures of description (range, Q.D., M.D., S.D.)           |                 |
| <b>Unit 6. Bivariate data analysis</b>                           | <b>[8 Hrs.]</b> |
| 6.1. Correlation (karl pearson's coefficient of correlation)     |                 |
| 6.2. Lines of regression, equations of regression                |                 |

**Unit 7. Classification and Tabulation****[6 Hrs.]**

- 7.1. Definition and terminology of probability
- 7.2. Counting rule (permutation and combination)
- 7.3. Addition theorem of probability
- 7.4. Theorem of compound probability or multiplication

**Unit 8. Classification and Tabulation****[10 Hrs.]**

- 8.1. Random variables
- 8.2. Binomial Distribution
- 8.3. Poisson distribution
- 8.4. Normal distribution

| Final written exam evaluation scheme |                                         |           |                     |
|--------------------------------------|-----------------------------------------|-----------|---------------------|
| Unit                                 | Title                                   | Hours     | Marks Distribution* |
| 1                                    | Introduction of Statistics              | 3         | 5                   |
| 2                                    | Collection of data                      | 3         | 5                   |
| 3                                    | Classification and Tabulation           | 3         | 5                   |
| 4                                    | Diagrammatic and graphic representation | 4         | 5                   |
| 5                                    | Summarizing a data set                  | 8         | 15                  |
| 6                                    | Bivariate data analysis                 | 8         | 15                  |
| 7                                    | Concept of probability                  | 6         | 10                  |
| 8                                    | Theoretical probability distribution    | 10        | 20                  |
|                                      | <b>Total</b>                            | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

**References:**

- 1. Dr. Arun Kumar Chaudhary, Aswin 2078, Business statistics, Bhudipuran Prakashan, Bagbazar.
- 2. S.C. Gupta, 2018, Fundamentals of statistics, Himalaya Publishing House, India
- 3. H.C. Saxena, 17<sup>th</sup> edition, Elementary Statistics, S.Chand & CO. Ltd., India

### Third Year/ First Part

| S.N. | Course Code | Subject                            |
|------|-------------|------------------------------------|
| 1    | EG3101CT    | Computer Graphics                  |
| 2    | EG3102CT    | Data Communication and Network     |
| 3    | EG3103CT    | Operating System                   |
| 4    | EG3101IT    | Cloud Computing                    |
| 5    | EG3102IT    | Software Development               |
| 6    |             | Elective I                         |
|      | EG3103IT.1  | a) Geographical Information System |
|      | EG3103IT.2  | b) Management Information System   |
|      | EG3103IT.3  | c) Data Mining                     |
| 7    | EG3104IT    | Minor Project                      |

## Computer Graphics EG3101CT

**Year: III**  
**Part: I**

**Total: 6 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: ... hours/week**  
**Lab: 2 hours/week**

### **Course description:**

This course deals with graphics hardware, two dimensional and three-dimensional graphics, fundamentals of animation techniques; graphical user interface design, web graphics design and graphics design packages.

### **Course objectives:**

After completion of this course students will be able to:

1. Acquire the knowledge of computer graphics.
2. Familiarize with hardware involved in graphics.
3. Familiarize with the algorithms to generate two-dimensional and three-dimensional graphical objects and animations.

### **Course Contents:**

#### Theory

#### **Unit 1. Introduction [3 Hrs.]**

- 1.1. History of Computer Graphics
- 1.2. Application of Computer Graphics
- 1.3. CAD and CAM

#### **Unit 2. Graphics Hardware [8 Hrs.]**

- 2.1. Input Hardware
  - 2.1.1. Keyboard, Mouse (mechanical & optical), Light pen, Touch panel (Optical, Sonic, and Electrical), Digitizers (Electrical, Sonic, Resistive), Scanner, Joystick
- 2.2. Output Hardware
  - 2.2.1. Monitors
  - 2.2.2. Monochromatic CRT Monitors
  - 2.2.3. Color CRT Monitors
  - 2.2.4. Flat Panel Display Monitors
- 2.3. Hardcopy Devices
  - 2.3.1. Plotters
  - 2.3.2. Printers
- 2.4. Raster and Vector Display Architectures, Principles and Characteristics

#### **Unit 3. Two Dimensional Algorithms and Transformations [10 Hrs.]**

- 3.1. Mathematical Line Drawing Concept
- 3.2. Line Drawing Algorithms
  - 3.2.1. Digital Differential Analyzer (DDA)
  - 3.2.2. Bresenham's Line Drawing Algorithm
- 3.3. Mid-point Circle Drawing
- 3.4. Mid-point Ellipse Drawing Algorithm
- 3.5. Review of Matrix Operations – Addition and Multiplication
- 3.6. Two-dimensional Transformations
  - 3.6.1. Translation

- 3.6.2. Scaling
- 3.6.3. Rotation
- 3.6.4. Reflection
- 3.6.5. Shearing
- 3.7. Two-Dimensional Viewing Pipeline

#### **Unit 4. Three-Dimensional Graphics**

**[16 Hrs.]**

- 4.1. Three-dimensions transformations
  - 4.1.1. Translation
  - 4.1.2. Scaling
  - 4.1.3. Rotation
  - 4.1.4. Reflection
  - 4.1.5. Shearing
- 4.2. Three-dimensional Viewing Pipeline
- 4.3. Three-dimensions Projections
  - 4.3.1. Concept of Projection
  - 4.3.2. Projection of 3D Objects onto 2D Display Devices
  - 4.3.3. Three-dimensional Projection Methods
    - 4.3.3.1. Parallel Projection Method
    - 4.3.3.2. Perspective Projection Method
- 4.4. Three-dimensional Object Representations
  - 4.4.1. Polygon Surfaces
  - 4.4.2. Polygon Tables
- 4.5. Introduction to Hidden Line and Hidden Surface Removal Techniques
  - 4.5.1. Object Space Method
  - 4.5.2. Image Space Method
- 4.6. Introduction to Illumination/ Lighting Models
  - 4.6.1. Ambient Model
  - 4.6.2. Diffuse Model
  - 4.6.3. Specular Model
- 4.7. Introduction to Shading/ Surface Rendering Models
  - 4.7.1. Constant Shading Model
  - 4.7.2. Gouraud Shading Model
  - 4.7.3. Phong Shading Model

#### **Unit 5. Web Graphics Designs and Graphics Design Packages**

**[5 Hrs.]**

- 5.1. Introduction to graphics file formats
- 5.2. Principles of web graphics design – browser safe colors, size, resolution, background, anti-aliasing
- 5.3. Type, purposes and features of graphics packages
- 5.4. Examples of graphics packages and libraries

#### **Unit 6. Virtual Reality**

**[3 Hrs.]**

- 6.1. Introduction
- 6.2. Types of Virtual Reality
  - 6.2.1. Non-immersive Virtual Reality
  - 6.2.2. Semi-immersive Virtual Reality
  - 6.2.3. Fully-immersive Virtual Reality
  - 6.2.4. Augmented Virtual Reality
  - 6.2.5. Collaborative Virtual Reality

### 6.3. Applications of Virtual Reality

#### Practical:

[30 Hrs.]

As a part of the laboratory exercise, the students should implement all the algorithms studied in different chapters. At the end, students are required to integrate the codes they have written in earlier practical sessions to create a small project.

The lab contains few sessions dedicated to introduce the students to some of the popular professional graphics packages and CAD packages and explore their features. The course/lab instructor recommends packages to use.

Some algorithm implementation sessions may include:

1. Implementation of Digital Differential Analyzer (DDA), a line Drawing Algorithm.
2. Implementation of Bresenham's Line Drawing Algorithm.
3. Implementation of mid-point Circle Drawing Algorithm.
4. Implementation of mid -point Ellipse Drawing Algorithm.
5. Implementation of basic 2D transformation.
6. Implementation of basic 3D transformation.
7. Implementation of basic projections.

| Final written exam evaluation scheme |                                                   |           |                     |
|--------------------------------------|---------------------------------------------------|-----------|---------------------|
| Unit                                 | Title                                             | Hours     | Marks Distribution* |
| 1                                    | Introduction                                      | 3         | 6                   |
| 2                                    | Graphics Hardware                                 | 8         | 15                  |
| 3                                    | Two Dimensional Algorithms and Transformations    | 10        | 20                  |
| 4                                    | Three-Dimensional Graphics                        | 16        | 25                  |
| 5                                    | Web Graphics Designs and Graphics Design Packages | 5         | 8                   |
| 6                                    | Virtual Reality                                   | 3         | 6                   |
|                                      | <b>Total</b>                                      | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

#### References:

1. D. Hearn and M. P. Baker, "Computer Graphics", PHI Edition
2. T. I. James, D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes, "Computer Graphics, Principles, and Practice", PHI Edition

## Data Communication and Computer Network

EG3102CT

**Year: II**  
**Part: I**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: hours/week**  
**Lab: 3 hours/week**

### Course description:

This course is designed to understand computer networks and digital data communications with a focus on Internet protocols: Application layer architectures (client/server, peer-to-peer) and protocols (HTTP-web, SMTP-mail, etc), Transport layer operation: (reliable transport, congestion and flow control, UDP, TCP); Network layer operation - (routing, addressing, IPv4 and IPv6), Data Link layer operation (error detection/correction, access control, Ethernet, 802.11, Physical Layer operation. Similarly, selected topics such as: network security (Network attack, cryptography, VPN, firewall).

### Course objectives:

After completion of this course students will be able to:

1. Gain a good understanding of the architecture of computer networks.
2. Identify and understand various hardware devices and software used in computer networks.
3. Learn different types of protocols used for transmission of data.
4. Use routing and addressing.
5. Setup small home/office networks.

### Course Contents:

#### Theory

#### Unit 1. Introduction

**[4 Hrs.]**

- 1.1. Definition, Advantages and disadvantages, applications
- 1.2. Communication system: Analog and digital, Block diagram
- 1.3. Network as platform, Internet architecture, Trends in networking
- 1.4. Data Transmission: Analog and digital transmission
- 1.5. Transmission impairment

#### Unit 2. Network Architecture and Hardware/Software

**[9 Hrs.]**

- 2.1. Network topologies
- 2.2. Network types: PAN, LAN, MAN, WAN, Intranet, Internet, Extranet
- 2.3. Layered network architecture, protocols, interfaces, services
- 2.4. OSI reference model
- 2.5. TCP/IP model
- 2.6. Network workstation and server: Hardware and software requirements
- 2.7. Client server and peer-to-peer model
- 2.8. Network devices: Repeater, Hub, NIC, Bridge, Switch, Router, Gateway

#### Unit 3. Physical Layer

**[4 Hrs.]**

- 3.1. Channel bandwidth and throughput; Propagation time; transmission time
- 3.2. Transmission media:
  - 3.2.1. Guided: Coaxial, twisted-pair, fiber-optic
  - 3.2.2. Unguided: radio waves, microwaves, infrared, satellite

### 3.3. Introduction of Frame Relay, ATM, ISDN, PSTN and X.25

## **Unit 4. Data link Layer**

**[6 Hrs.]**

- 4.1. Introduction and function of data link layer and its issues
- 4.2. Framing
- 4.3. Flow Control issues at data link layer
- 4.4. Piggybacking and Sliding Window Protocol
- 4.5. Error Control issues at data link layer
- 4.6. Error Detection Method and Error Correction Method
- 4.7. Data Link Layer Protocol: HDLC, PPP

## **Unit 5. LAN Architectures/standards**

**[4 Hrs.]**

- 5.1. Introduction of LAN standards and architecture
- 5.2. Media access control, MAC address
- 5.3. ALOHA, FDDI, VLAN, CSMA/CD, Token ring, Token bus and IEEE 802.3, 802.4, 802.1(wireless LAN)

## **Unit 6. Network Layer**

**[8 Hrs.]**

- 6.1. Internetworking
- 6.2. Circuit switching and packet switching
- 6.3. Addressing issues at network layer
- 6.4. IP address, Different classes, Private and Public address
- 6.5. Subnet mask and sub-netting: Classless addressing; Network Address Translation (NAT)
- 6.6. Routing and its necessity; static and dynamic routing; interior and exterior routing
- 6.7. Dynamic routing and Static routing
- 6.8. Network layer protocols
- 6.9. Introduction to IPV6 and its necessity

## **Unit 7. Transport Layer**

**[4 Hrs.]**

- 7.1. Transport layer issues:
  - 7.1.1. Congestion control
  - 7.1.2. Flow control
  - 7.1.3. Quality of service
- 7.2. Transport layer addressing sockets, Port
- 7.3. Segmentation and reassembly
- 7.4. Connection oriented and connectionless service
- 7.5. TCP, UDP

## **Unit 8. Application Layer**

**[4 Hrs.]**

- 8.1. Application layer and its function
- 8.2. Electronic mail: SMTP, POP3, IMAP
- 8.3. File transfer: FTP, PUTTY, WinSCP
- 8.4. Web: HTTP, HTTPs
- 8.5. Dynamic host configuration protocol (DHCP)
- 8.6. DNS, WWW

## **Unit 9. Network Security**

**[2 Hrs.]**

- 9.1. Properties of Secure Communication

- 9.2. Network attacks: Active and Passive attacks
- 9.3. Cryptography: Symmetric Key and public key, Digital signature
- 9.4. Firewalls
- 9.5. Virtual private network

**Practical:** [45 Hrs.]

In practical, students should be able to set up small networks. They should be able to configure network hardware and network software. Following lab exercises may be helpful.

1. Configuration of network interface card and various network devices like hub, switch, router, etc.
2. Cabling: Construction of straight- through and cross-over cable and verify the physical layer connectivity.
3. Configuration of workstation PC
4. Setup peer-to-peer networking and verify it
5. Configuration of server for client server networking; also verify it.
6. Familiarization with basic network commands: Observing IP address and MAC address, Setting IP address and default gateway in PC, Verifying network layer connectivity
7. Configure the PC to obtain IP from DHCP, Release the leased IP, Renew IP (for this there should a DHCP server) -6 and 7 merge
8. Create multiple networks and route packets across multiple networks using static routing
9. Dynamic routing (e.g. RIP) and default route
10. Configure HTTP, FTP, DHCP server and verify it
11. Configuration of DNS and e-mail server
12. Design of local area network (LAN)
13. Case study: Organizational visit to study existing network system

**Note: Use packet Tracer software for performing the above practical lab works**

| Final written exam evaluation scheme |                                            |           |                     |
|--------------------------------------|--------------------------------------------|-----------|---------------------|
| Unit                                 | Title                                      | Hours     | Marks Distribution* |
| 1                                    | Introduction                               | 4         | 7                   |
| 2                                    | Network Architecture and Hardware/software | 9         | 16                  |
| 3                                    | Physical Layer                             | 4         | 7                   |
| 4                                    | Data link Layer                            | 6         | 11                  |
| 5                                    | LAN Architectures/standards                | 4         | 7                   |
| 6                                    | Network Layer:                             | 8         | 14                  |
| 7                                    | Transport Layer                            | 4         | 7                   |
| 8                                    | Application Layer                          | 4         | 7                   |
| 9                                    | Network Security                           | 2         | 4                   |
|                                      | <b>Total</b>                               | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

**References**

1. Behrouz Forouzan, “Data Communications and Networking”, Edition 5, Tata McGraw-Hill., 2012.

2. Andrews S. Tanenbaum, David J Wetherall, "Computer Networks", Edition 5, Pearson Education, 2012.
3. William Stallings, "Data & Computer Communications", PHI, Edition 6, 2012.
4. Jerry Fitzgerald, Alan Dennis, "Business Data Communications & Networking", John Wiley & Sons Inc, 2010.

## Operating System EG3103CT

**Year: III**  
**Part: I**

**Total: 5 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: hours/week**  
**Practical: hours/week**  
**Lab: 2 hours/week**

### **Course description:**

This course includes the basic concepts and core structure, functions and design principles of operating system. It consists of the various functions of operating system like process and memory management, file and I/O Management, Deadlock Management and Security. The course gives ideas in designing the operating system and its services.

### **Course objectives**

After completion of this course students will be able to:

1. Describe the functions of operating system.
2. Explain design of the operating system and its components.
3. Demonstrate and simulate the algorithms used in operating system.

### **Course Contents:**

#### Theory

#### **Unit 1. Introduction [6 Hrs.]**

- 1.1. Operating system and its functions
- 1.2. Evolution of Operating System
- 1.3. Types of Operating System
- 1.4. Operating System Components
- 1.5. Operating System Services: System Call, Shell
- 1.6. Example of Operating System: Unix, Linux, Windows, Handheld OS

#### **Unit 2. Process Management [10 Hrs.]**

- 2.1. Process Vs Program, Process States, Process Models, Process Control Box
- 2.2. Process Vs Thread, Thread Models, Multithreading
- 2.3. Process Scheduling Criteria, Algorithms and Goals
  - 2.3.1. Batch System: FIFO, SJF, SRTN
  - 2.3.2. Interactive System: RR, HRRN
- 2.4. Critical Section, Race Condition, Mutual Exclusion
- 2.5. Producer Consumer Problem

#### **Unit 3. Memory Management [10 Hrs.]**

- 3.1. Concept of Multiprogramming
- 3.2. Memory Management functions
- 3.3. Multiprogramming with fixed partition
- 3.4. Multiprogramming with variable partition
- 3.5. Internal Vs External fragmentation
- 3.6. Memory Allocation: First Fit, Worst Fit, Best Fit
- 3.7. Concept of Paging and Page fault

#### **Unit 4. Deadlock Management [8 Hrs.]**

- 4.1. Deadlock Concept
- 4.2. Deadlock Conditions

- 4.3. Deadlock Handling Strategies:
  - 4.3.1. Deadlock Prevention
  - 4.3.2. Deadlock Detection
  - 4.3.3. Deadlock Avoidance
  - 4.3.4. Recovery from Deadlock
- 4.4. Banker's Algorithm

## **Unit 5. File and Input/output Management [6 Hrs.]**

- 5.1. File: Naming, Structure, Types, Access, Attributes, Operations, Directory Systems
- 5.2. File System Layout
- 5.3. Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes
- 5.4. Principle of I/O Hardware and Software
- 5.5. Disk Formatting, Disk Arm Scheduling, Stable Storage, Error Handling

## **Unit 6. Security [5 Hrs.]**

- 6.1. Security Goals
- 6.2. Security Attacks
- 6.3. Active and Passive Attacks
- 6.4. Cryptography Basics
- 6.5. Access Control List
- 6.6. Protection Mechanisms

## **Practical: [30 Hrs.]**

- 1. Installation of Virtual Machine, Linux and Windows [4 Hrs.]
- 2. Linux Basic Commands [2 Hrs.]
- 3. Implementation of Process Scheduling Algorithms [8 Hrs.]
- 4. Process Creation, Termination [4 Hrs.]
- 5. Inter process communication [4 Hrs.]
- 6. Implementation of Banker's Algorithm [4 Hrs.]
- 7. Implement some Memory Management Schemes [4 Hrs.]

| <b>Final written exam evaluation scheme</b> |                         |              |                            |
|---------------------------------------------|-------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>            | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Introduction            | 6            | 11                         |
| 2                                           | Process Management      | 10           | 18                         |
| 3                                           | Memory Management       | 10           | 18                         |
| 4                                           | Deadlock Management     | 8            | 13                         |
| 5                                           | File and I/O Management | 6            | 11                         |
| 6                                           | Security                | 5            | 9                          |
|                                             | <b>Total</b>            | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

## **References:**

- 1. Andrew S. Tanenbaum, "Modern Operating Systems", 3rd Edition, PHI
- 2. Stalling William, "Operating Systems", 6th Edition, Pearson Education
- 3. Silberschatz A., Galvin P., Gagne G., "Operating System Concepts", 8th Edition, John Wiley and Sons

## Cloud Computing

EG3101IT

**Year: III**  
**Part: I**

**Total: 5 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: hours/week**  
**Practical: hours/week**  
**Lab: 2 hours/week**

### Course description:

This course offers detailed concept, applications, principles and implementation of cloud computing. It includes introduction, Cloud Computing Architecture, Cloud Virtualization, Cloud Programming Models, Cloud security and applications. It does not entirely focus on theoretical concept but also strongly focuses on practical skill-based learning.

### Course objectives:

After completion of this course students will be able to:

1. Use theoretical as well as practical knowledge of cloud computing
2. Design, Implement and manage the issues of cloud computing
3. Gain practical knowledge on Cloud security and applications

### Course Contents

#### Theory

#### Unit 1. Introduction

**[6 Hrs.]**

- 1.1. Overview and evolution of Cloud Computing
- 1.2. Characteristics of Cloud Computing
- 1.3. Types of cloud and its services
- 1.4. Applications of cloud computing
- 1.5. Cloud Storage
- 1.6. Cloud services requirements
- 1.7. Cloud infrastructure
- 1.8. Cloud adoption

#### Unit 2. Cloud reference and deployment models

**[8 Hrs.]**

- 2.1. Platform as service
- 2.2. Software as a service
- 2.3. Infrastructure as service
- 2.4. Public clouds
- 2.5. Private clouds
- 2.6. Community cloud
- 2.7. Hybrid clouds

#### Unit 3. Cloud Virtualization technology

**[8 Hrs.]**

- 3.1. Overview of Virtualization techniques
- 3.2. Types of Virtualizations
  - 3.2.1. Full virtualization
  - 3.2.2. Para Virtualization
- 3.3. Virtualization benefits
- 3.4. Server virtualization
- 3.5. Hypervisor management software
- 3.6. VMware features and infrastructure
  - 3.6.1. Virtual Box
  - 3.6.2. Thin client

**Unit 4. Cloud security****[6 Hrs.]**

- 4.1. Introduction to Security
- 4.2. Cloud Security challenges and Risks
- 4.3. Software-as-a-Service Security
- 4.4. Security Monitoring
- 4.5. Security Architecture Design
- 4.6. Data Security
- 4.7. Application Security
- 4.8. Virtual Machine Security
- 4.9. Identity Management and Access Control

**Unit 5. Cloud platforms****[8 Hrs.]**

- 5.1. Web services
- 5.2. App Engine
- 5.3. Azures Platform
- 5.4. Aneka
- 5.5. Open challenges
- 5.6. Scientific applications
- 5.7. Business and Consumer applications

**Unit 6. Cloud applications****[9 Hrs.]**

- 6.1. Migration to the cloud
- 6.2. Software Licenses
- 6.3. Cloud cost model
- 6.4. Cloud applications for service level
- 6.5. Web application design
- 6.6. Privacy design
- 6.7. Cloud for IoT
- 6.8. Amazon Web Services for IoT

**Practical:****[30 Hrs.]**

- 1. Install Virtualbox/VMware Workstation with different operating system such as linux or windows OS
- 2. Install Google App Engine.
- 3. Develop simple web applications.
- 4. Find a procedure to transfer the files from one virtual machine to another virtual machine.
- 5. Install Hadoop single node cluster and run simple applications like wordcount.
- 6. Implement SAAS security.

| Final written exam evaluation scheme |                                       |       |                     |
|--------------------------------------|---------------------------------------|-------|---------------------|
| Unit                                 | Title                                 | Hours | Marks Distribution* |
| 1                                    | Introduction                          | 6     | 11                  |
| 2                                    | Cloud reference and deployment models | 8     | 14                  |
| 3                                    | Cloud Virtualization technology       | 8     | 14                  |
| 4                                    | Cloud security                        | 6     | 11                  |
| 5                                    | Cloud platforms                       | 8     | 14                  |
| 6                                    | Cloud applications                    | 9     | 16                  |

|  |              |           |           |
|--|--------------|-----------|-----------|
|  | <b>Total</b> | <b>45</b> | <b>80</b> |
|--|--------------|-----------|-----------|

\* There may be minor deviation in marks distribution.

### **References:**

1. Dr. Kumar Saurabh, Cloud Computing
2. Raj Kumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, Mastering Cloud Computing
3. David S. Linthicum, Cloud Computing and SOA Convergence in your enterprise
4. Barrie Sosinsky, Cloud Computing Bible
5. Saurabh, K. (2011). Cloud Computing – Insights into New -Era Infrastructure, Wiley India.

## Software Development EG3102IT

**Year: III**  
**Part: I**

**Total: 5 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: ... hour/week**  
**Practical: ... hours/week**  
**Lab: 2 hours/week**

### Course description:

This course aims to guide the students in both the theoretical and practical aspects of developing computer solutions for real-world problems. One will study the tools and techniques used in analysis and design of software systems, and apply those tools within a recognized software development methodology and within the context of a case study.

### Course objectives:

After completion of this course students will be able to:

1. Explain the theory and foundations of software development.
2. Apply the concept of different phase of system development life cycle while designing a software.
3. Draw the Context diagram, DFD and ER Diagram of a system.
4. Apply fact-finding and problem-solving skills.

### Course Contents:

#### Theory

#### Unit 1. Introduction

**[10 Hrs.]**

- 1.1. Software Development Fundamentals
  - 1.1.1. General definition
  - 1.1.2. Program versus software
  - 1.1.3. Software process
  - 1.1.4. Software characteristics
  - 1.1.5. Software applications
  - 1.1.6. Some terminologies
    - 1.1.6.1. Deliverables and milestones
    - 1.1.6.2. Product and process
    - 1.1.6.3. Measures, metrics and measurement
    - 1.1.6.4. Software process and product metrics
    - 1.1.6.5. Generic and customized software product
  - 1.1.7. Roles of management in software development
    - 1.1.7.1. People, product, process and project
- 1.2. Introduction to System
- 1.3. Information System and its types
- 1.4. System development Life cycle
- 1.5. System development models
  - 1.5.1.1. The waterfall model
  - 1.5.1.2. Spiral model
  - 1.5.1.3. Prototyping model
  - 1.5.1.4. Introduction to Agile Development
- 1.6. Role and attributes of system analyst
- 1.7. Tools Used by System Analyst

#### Unit 2. Development Tools

**[8 Hrs.]**

- 2.1. Introduction to DFD and context diagram

- 2.2. Describing a system with context diagram and DFD
- 2.3. Levels in DFD (upto level 2)
- 2.4. Physical and Logical DFD with example
- 2.5. Introduction to ER Diagram
- 2.6. Describing a system with ER Diagram

### **Unit 3. Feasibility Analysis**

**[4 Hrs.]**

- 3.1. Cost-benefit analysis technique
- 3.2. Return of Investment (ROI)
- 3.3. Payback Period
- 3.4. Feasibility Report
- 3.5. System Proposal and its components

### **Unit 4. Software Project Planning**

**[5 Hrs.]**

- 4.1. Size estimation
- 4.2. Cost estimation
- 4.3. Project Scheduling
- 4.4. The constructive cost model (COCOMO)
- 4.5. COCOMO II
- 4.6. Software risk management

### **Unit 5. Input –Output Design**

**[4 Hrs.]**

- 5.1. Input form Design
- 5.2. Input Screen Design
- 5.3. Menu Design
- 5.4. Output Design

### **Unit 6. Software Reliability**

**[4 Hrs.]**

- 6.1. Basic Concepts
- 6.2. Software quality
- 6.3. Software reliability model
- 6.4. Capability Maturity Model (CMM)

### **Unit 7. Software Testing**

**[5 Hrs.]**

- 7.1. Software Verification and Validation
- 7.2. Testing process
- 7.3. Black box or functional testing
- 7.4. White Box Testing or Structural testing
- 7.5. Levels of testing: unit, integration, system, user acceptance testing
- 7.6. Testing tools

### **Unit 8. Software Maintenance**

**[5 Hrs.]**

- 8.1. Introduction
- 8.2. Maintenance process
- 8.3. Maintenance model
- 8.4. Estimation of maintenance costs
- 8.5. Documentation

### **Practical**

**[30 Hrs.]**

- 1. The practical should contain all features mentioned above.

**Project Work:**

Visit well-established organization and perform as follows and submit the report.

- a) Define problem.
- b) Do requirement collections and perform feasibility analysis.
- c) Mention the life cycle model preferred.
- d) Show your planning for the project.
- e) Specify the design followed.
- f) Mention its reliability.

| Final written exam evaluation scheme |                           |           |                     |
|--------------------------------------|---------------------------|-----------|---------------------|
| Unit                                 | Title                     | Hours     | Marks Distribution* |
| 1                                    | Introduction              | 10        | 18                  |
| 2                                    | Development Tools         | 8         | 14                  |
| 3                                    | Feasibility Analysis      | 4         | 7                   |
| 4                                    | Software Project Planning | 5         | 9                   |
| 5                                    | Input –Output Design      | 4         | 7                   |
| 6                                    | Software Reliability      | 4         | 7                   |
| 7                                    | Software Testing          | 5         | 9                   |
| 8                                    | Software Maintenance      | 5         | 9                   |
|                                      | <b>Total</b>              | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

**References:**

1. Sommerville, Ian. Software Engineering, Addison-Wesley, ISBN 0-201-17568-1
2. Jones, Roger. Software Engineering.
3. Pressman, Roger S. Software Engineering: A Practitioner's Approach, McGraw Hill International Edition, 6th edition.
4. Ghezzi, Jayazeri and Mandrioli. Fundamentals of Software Engineering, PrenticeHall
5. Pfleeger Shari. Software Engineering: The Production of Quality Software, Macmillan, ISBN 0-02-395115-X, 2nd Edition
6. V. Rajaraman, "Analysis and design of information Systems"
7. Elias M. Awad, "Systems Analysis and design"
8. Vinod Kumar Garg and S. Srinivasan, "Workbook on Systems analysis and design"

**Geographical Information System**  
(Elective I)  
EG3103IT.1

**Year: III**

**Part: I**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: 0 hours/week**  
**Lab: 3 hours/week**

**Course description:**

This course is designed to introduce students a computer-based GIS, Geographic Information Systems, and its applications to spatial data management as a tool to understand the world by describing and explaining the human relationship to the physical environment.

**Course objectives:**

After completion of this course students will be able to:

1. Explain GIS, development and components of GIS.
2. Explain data capturing techniques.
3. Analyze spatial and non- spatial data.

**Course Contents:**

**Theory**

**Unit 1. Introduction** **[ 4 Hrs.]**

- 1.1. Historical Background
- 1.2. Scope and application areas
- 1.3. Benefits and importance
- 1.4. Functional components
- 1.5. GIS in Organizations
- 1.6. Elements of GIS

**Unit 2. Coordinate System** **[4 Hrs.]**

- 2.1. Geographic coordinate system
- 2.2. Map Projections
- 2.3. Commonly used map projection system
- 2.4. projected coordinate system

**Unit 3. Data Models** **[7 Hrs.]**

- 3.1. Introduction, Common Spatial Data Models
- 3.2. Vector Data, Raster Data
- 3.3. Other Data Models:
  - 3.3.1. TINs
  - 3.3.2. Object Data Model
  - 3.3.3. 3-d Data Model
- 3.4. Data and File Structure

**Unit 4. Maps, Digitization and Output** **[10 Hrs.]**

- 4.1. Map concept
  - 4.1.1. map elements
  - 4.1.2. map layers

- 4.1.3. map scales and representation
- 4.1.4. Map Boundaries and Spatial Data
- 4.2. Digitizing
  - 4.2.1. The Digitizing Process
  - 4.2.2. Digitizing Errors
  - 4.2.3. Node and Line Snapping
- 4.3. Reshaping
  - 4.3.1. Line Smoothing and Thinning
  - 4.3.2. Scan Digitizing, Editing Geographic Data
  - 4.3.3. Features Common to Several Layers
- 4.4. Coordinate Transformation:
  - 4.4.1. Control Points
  - 4.4.2. The Affine Transformation
  - 4.4.3. Other Coordinate Transformations
  - 4.4.4. Caution When Evaluating Transformations
  - 4.4.5. Projection Vs Transformation.
- 4.5. Output: Maps, Digital Data, Metadata

#### **Unit 5. Capturing Data**

**[ 5 Hrs.]**

- 5.1. Different methods of data capture
- 5.2. Data preparation
- 5.3. Conversion and integration
- 5.4. GPS
- 5.5. Remote Sensing

#### **Unit 6. Spatial Analysis and Terrain Analysis**

**[9 Hrs.]**

- 6.1. Introduction
- 6.2. Selection and Classification
- 6.3. Proximity Functions and Buffering
- 6.4. Overlay: Raster Overlay, Vector Overlay
- 6.5. Terrain Analysis:
  - 6.5.1. Introduction
  - 6.5.2. Slope and Aspect
  - 6.5.3. Hydrologic Functions, Profile Plots, Contour Lines
  - 6.5.4. Viewsheds, Shaded Relief Maps

#### **Unit 7. Spatial Data Infrastructure**

**[6 Hrs.]**

- 7.1. SDI concepts and its current trend
- 7.2. The concept of metadata and clearing house
- 7.3. Critical factors around SDIs

#### **Practical:**

**[45 Hrs.]**

- 1. Handle GIS devices
- 2. ArcGIS installation
- 3. Explore interactive GIS, create map layouts, Reuse a custom map layout
- 4. Build a file geodatabase, Use Arc Catalog utilities, modify an attribute table, Join tables
- 5. Examine metadata, Work with map projections, learn about vector data formats, Explore sources of vector maps

6. Digitize polygon features, use advanced edit tools, digitize point features, Digitize line features
7. Map Designing using tools

| <b>Final written exam evaluation scheme</b> |                                             |              |                            |
|---------------------------------------------|---------------------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                                | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Introduction                                | 4            | 7                          |
| 2                                           | Coordinate system                           | 4            | 7                          |
| 3                                           | Data Models                                 | 7            | 12                         |
| 4                                           | Map, Digitization and output                | 10           | 18                         |
| 5                                           | Capturing Real World                        | 5            | 9                          |
| 6                                           | Spatial Analysis & Terrain Analysis         | 9            | 16                         |
| 7                                           | Introduction to Spatial Data Infrastructure | 6            | 11                         |
|                                             | <b>Total</b>                                | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

#### **References:**

1. De By R, Knippers R.A, sun Y. Principles of geographic information systems: An introductory textbook, international institute for Geoinformation science and Earth observation, the Netherlands
2. Paul B, GIS Fundamentals: A First Text on Geographic Information Systems Fifth Edition,
3. Chang K.T. Introduction to Geographic Information System

## Management Information System

(Elective I)

EG3103IT.2

**Year: III**

**Part: I**

**Total: 7 hours /week**

**Lecture: 3 hours/week**

**Tutorial: 1 hour/week**

**Practical: 0 hours/week**

**Lab: 3 hours/week**

### Course Description:

The main aim of this course is to introduce the Management of Information Systems (MIS). Managing information systems has become a task for all levels of managers and all function areas of the business. This MIS course is designed to familiarize students with the concepts related to the utilization of information technology in business organizations. This course will focus on technical and managerial aspects of information technology adoption in the organization. This course should provide the student with knowledge of the core principles of MIS, focusing on breadth rather than depth of knowledge. In this course has included case studies, group assignments, and related software exercises that will provide an opportunity to apply MIS concepts to real-world applications.

### Course Objectives:

After completing this course, the student will able to:

1. Explain the significance of information systems in organizations, Strategic management processes and the implications for the management.
2. Describe different types of management information systems.
3. Identify the basic technologies used in the field of Management Information System.
4. Explain the developments of electronic commerce and the role of Internet.
5. Describe the processes of developing and implementing information systems.
6. Familiarize with ethical and social issues related to information system.

### Course contents:

#### Theory

#### **Unit 1. Foundation of Information System [7 Hrs.]**

- 1.1. Introduction to information system
- 1.2. Role of information system in Business
- 1.3. Components of Information Systems
- 1.4. Types of information systems
- 1.5. Effectiveness and efficiency criteria in information system

#### **Unit 2. An overview of Management Information Systems [6 Hrs.]**

- 2.1. Structure of a Management information system
- 2.2. Structure of a Management information system
- 2.3. MIS versus Data processing
- 2.4. Decision Making In MIS
- 2.5. MIS & Information Resources Management

#### **Unit 3. Concept of Planning [8 Hrs.]**

- 3.1. Concept of organizational planning

- 3.2. The Planning Process
- 3.3. Computational support for planning
- 3.4. The importance of planning
- 3.5. Business applications of information technology
- 3.6. Information System for Business Operations (SDLC)
- 3.7. Information System for Strategic Advantage
- 3.8. Decision Support Systems and its benefits and characteristic

#### **Unit 4. Managing Information Technology** **[5 Hrs.]**

- 4.1. Enterprise & global management
- 4.2. Security & Ethical challenges
- 4.3. Planning & implementing changes
- 4.4. Information Technology Trends

#### **Unit 5. MIS in functional areas of business** **[7 Hrs.]**

- 5.1. Accounting information systems
- 5.2. Geographical information systems
- 5.3. Human resource information systems
- 5.4. Inventory information systems
- 5.5. Manufacturing information systems
- 5.6. Marketing information systems
- 5.7. Quality information systems

#### **Unit 6. Information Security** **[6 Hrs.]**

- 6.1. Security threats and vulnerability
- 6.2. Controlling security threat and Vulnerability
- 6.3. Management security threat in e-Business
- 6.4. Disaster management
- 6.5. MIS and Security Challenges
- 6.6. Firewall

#### **Unit 7. Knowledge Based Systems** **[3 Hrs.]**

- 7.1. Artificial intelligence
- 7.2. Expert systems
- 7.3. Neural networks

#### **Unit 8. Office Information System** **[3 Hrs.]**

- 8.1. Nature of office
- 8.2. Types of office information systems
- 8.3. Client server computing

**Practical:** **[45 Hrs.]**

#### **Project Work:**

Students should complete at least one MIS Project on the following Topics by including the above contents.

1. Restaurant Information System
2. College Management System

| Final written exam evaluation scheme |       |       |                     |
|--------------------------------------|-------|-------|---------------------|
| Unit                                 | Title | Hours | Marks Distribution* |

|   |                                               |           |           |
|---|-----------------------------------------------|-----------|-----------|
| 1 | Foundation of Information System              | 7         | 12        |
| 2 | An overview of Management Information Systems | 6         | 11        |
| 3 | Concept of planning                           | 8         | 14        |
| 4 | Managing Information Technology               | 5         | 10        |
| 5 | MIS in functional areas of business           | 7         | 12        |
| 6 | Information Security                          | 6         | 11        |
| 7 | Knowledge Based Systems                       | 3         | 5         |
| 8 | Office Information System                     | 3         | 5         |
|   | <b>Total</b>                                  | <b>45</b> | <b>80</b> |

\* There may be minor deviation in marks distribution.

#### References:

1. Brian (2004). *Introduction to Information System*. New York: MCGRAW HILL.
2. Murdick (1971). *Information System for Modern Management* New Jersey:PHI.
3. Jawadekar,S.S(2019). *Management Information System* (6<sup>th</sup> ed). India: MC GRAW HILL.

**Data Mining**  
(Elective I)  
EG3103IT.3

**Year: III**  
**Part: I**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: ... hours/week**  
**Lab: 3 hours/week**

**Course description:**

This course covers fundamental aspects of data mining. It deals with data mining and warehouse construction process, data mining models, techniques and various applications of data mining.

**Course objectives:**

After completion of this course students will be able to:

1. Explain the basic aspects of data mining and techniques.
2. Explain the data collection, cleaning, and aggregation issues.
3. Utilize statistical techniques for analyzing data.

**Course Contents:**

**Theory**

**Unit 1. Introduction** **[2 Hrs.]**

- 1.1. Data Mining
- 1.2. Data Mining and Knowledge Discovery Process
- 1.3. Importance of Data Mining

**Unit 2. Data Pre-Processing** **[7 Hrs.]**

- 2.1. Data Objects and attribute types
- 2.2. Statistical description of data
- 2.3. Data Preprocessing Concepts
- 2.4. Data Preprocessing
  - 2.4.1. Data Cleaning
  - 2.4.2. Data Integration
  - 2.4.3. Data Reduction
  - 2.4.4. Data Transformation

**Unit 3. OLAP and Multidimensional Data Analysis** **[8 Hrs.]**

- 3.1. OLAP Tool and operations
- 3.2. Online Transaction Processing (OLTP)
- 3.3. OLAP vs OLTP
- 3.4. OLAP servers
- 3.5. OLAP Architectures
  - 3.5.1. Relational OLAP
  - 3.5.2. Multidimensional OLAP
  - 3.5.3. Hybrid OLAP
  - 3.5.4. DOLAP

**Unit 4. Basic process in Data Warehouse** **[4 Hrs.]**

- 4.1. ETL (Extraction, Transform and Load) process

- 4.2. Importance of ETL
- 4.3. ELT (Extract, Load and Transform) Process
- 4.4. Difference between ETL and ELT

**Unit 5. Mining Frequent Pattern and Associations [6 Hrs.]**

- 5.1. Frequent patterns, Market basket analysis, Frequent Item sets, Support and Confidence, Association Rules
- 5.2. Finding Frequent Itemset (Apriori Algorithm)
- 5.3. Limitation and improving Apriori Algorithm

**Unit 6. Data Mining Models [12 Hrs.]**

- 6.1. Statistical Data Analysis Methods
  - 6.1.1. Histogram, Mean, Median, Mode, Variance and Standard deviation, Max, Min, Linear regression
  - 6.1.2. Boxplot Analysis
  - 6.1.3. Histogram Analysis
  - 6.1.4. Scatter plot
  - 6.1.5. Maximum Likelihood Method
  - 6.1.6. Bayesian Method
- 6.2. Cross Validation
- 6.3. Classification
  - 6.3.1. Decision Tree classifier
  - 6.3.2. ID3 Algorithm
  - 6.3.3. Entropy and Information gain
  - 6.3.4. Tree Pruning
- 6.4. Artificial Neural Network (ANN)
  - 6.4.1. Supervised Learning and Unsupervised Learning
  - 6.4.2. Perceptron
  - 6.4.3. Back Propagation in neural networks
- 6.5. Clustering
  - 6.5.1. SVM
  - 6.5.2. Partitioning method (K-means and K-medoids clustering)
  - 6.5.3. Hierarchical methods (Agglomerative Approach and Divisive Approach)

**Unit 7. Data Mining Applications [6 Hrs.]**

- 7.1. Techniques for mining large databases
  - 7.1.1. Text Mining
  - 7.1.2. Web Mining
  - 7.1.3. Visual data Mining
- 7.2. Data mining standards
- 7.3. Privacy and security issues

**Practical: [45 Hrs.]**

- 1. Select interesting data sets
- 2. Represent selected data in suitable form.
- 3. Extract feature and select necessary features.
- 4. Use data cleaning techniques.
- 5. Use descriptive statistical methods.
- 6. Implement K-means and k-medoids clustering algorithms K-means by using Weka

7. Implement decision tree classifier using Weka

| Final written exam evaluation scheme |                                          |           |                     |
|--------------------------------------|------------------------------------------|-----------|---------------------|
| Unit                                 | Title                                    | Hours     | Marks Distribution* |
| 1                                    | Introduction                             | 2         | 4                   |
| 2                                    | Data Pre-processing                      | 7         | 12                  |
| 3                                    | OLAP and Multidimensional Data Analysis  | 8         | 14                  |
| 4                                    | Basic process in Data Warehouse          | 4         | 7                   |
| 5                                    | Mining Frequent Pattern and Associations | 6         | 11                  |
| 6                                    | Data Mining Models                       | 12        | 21                  |
| 7                                    | Data Mining Applications                 | 6         | 11                  |
|                                      | <b>Total</b>                             | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

**References:**

1. Jiawei Han, Micheline Kamber, Jian Pei; *Data Mining: Concepts and Techniques*, Morgan Kaufman Publication, 3rd Edition
2. Pang-Ning Tan, Michael Steinbach, Anuj Karpatne, Vipin Kumar, *Introduction to Data Mining*, Pearson Publication, First Edition
3. Charu C. Agrawal, *Data Mining: The Textbook*, Springer Nature Publication, First Edition
4. Alex Berson and Stephen J. Smith, *Data Warehousing, Data Mining & OLAP*, Tata McGraw Hill, 1<sup>st</sup> Edition.

**Minor Project**  
EG3104IT

**Year: III**  
**Part: I**

**Total: 3 hours /week**  
**Lecture: ... hours/week**  
**Tutorial: ... hour/week**  
**Practical: 3 hours/week**  
**Lab: ... hours/week**

**Course description:**

This course provides students with an idea of how to transform the theoretical knowledge gained in earlier semesters into practical applications. The students will build a real-life project during this course using the knowledge gained in earlier semesters.

**Course objectives:**

After completing this course, the students will be able to:

1. Learn and gain the knowledge about the programming tool they used to implement the real-life project.
2. Plan, design, develop and implement the real-life problem as a project.
3. Formulate project documentation and oral presentation for his/her final year project.

**Project Overview:**

1. Group formation (3-4 persons / group)
2. Project concept development
  - a. Finding Project concept
  - b. Scope of project
  - c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

**The project should:**

1. Be intended to develop an IT solution to a practical problem
2. Be carried out using an engineering approach
3. Emphasize design
4. Be carried out in a group (3-4 person/group)
5. Normally result in the production of a piece of software
6. Include technical documentation based on documentation guideline.
7. Be fully described from inception to completion in a written report produced to a good level of professional competence

**Procedure:**

1. Explain the minor project concept in a class by project teachers.
2. Preliminary selection of topic.
3. Discussion with department regarding the feasibility/practicality of the project (e.g. cost, usefulness, market).

4. Finalization of topic.
5. Submission of the detail proposal (Extensive literature review).
6. After approval by project teachers, start of minor project work in laboratory /home.
7. Monitoring of the work progress by project teachers and report to department.
8. A mid-term progress report should be submitted by the student on the date fixed by department.
9. Presentation of mid-term progress of the minor project along with report.
10. Final presentation of minor project should be conducted by the department and should be evaluated by the project teachers in the presence of other teachers in the related field, not involved in minor projects, but from the same department.
11. Students must submit a group report in the format prescribed below.

### **Requirements for report writing:**

Font Name: Times New Roman

Top Margin: 1 inch

Left Margin: 1 inch

Right Margin: 1 inch

Bottom Margin: 1 inch

Gutter: 0.25 inch (left)

Header and Footer: 0.5 inch

Line Spacing: Single

Paragraph Spacing: 8 pt.

Font Size: 12 pt. (for normal text)

Follow following standard for headings

## **1. Heading1 (16pt, Bold)**

### **1.1. Heading2 (14pt, Bold)**

#### **1.1.1. Heading3 (13pt, Bold)**

##### **1.1.1.1. Heading4 (12pt, Bold)**

### **Arrangement of Contents in a report:**

The sequence of contents in a major project report is as follows

1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary
  - Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.
6. Table of Contents
  - The table of contents should list all material following it as well as any material which precedes it.
7. List of Figures (if any)
  - The list should use exactly the same captions as they appear below the figures in the text.
8. List of Tables (if any)
  - The list should use exactly the same captions as they appear above the tables in the text.
9. List of Symbols (if any)
  - The list should provide the detail of the symbols used in the report.

10. Abbreviations (if any)
  - Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.
11. Main body
  - 11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features, Feasibility, System Requirement)
  - 11.2. Chapter 2: Literature Review
  - 11.3. Chapter 3: Design and Methodology (e.g. System Design, methods used, tools, data source)
  - 11.4. Chapter 4: Result and Analysis
  - 11.5. Chapter 5: Conclusion, Recommendation and Limitations
12. References
  - The reference material should include the author name, title, year. Do not mention the references of the websites in the report.
13. Appendices (if any)
  - Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g. Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

**Page numbering:** The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc.). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc. at the bottom.

**Figure and Table numbering:** It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually the figure captions are written below the figure and table captions on top of the table.

#### **Evaluation Scheme:**

The marks should be evaluated by project teachers as well as other teachers in the related field on the basis of:

| S.N. | Topic                                 | Marks Distribution                                                         |
|------|---------------------------------------|----------------------------------------------------------------------------|
| 1    | Proposal Defense                      | 10                                                                         |
| 2    | Mid-term progress report/presentation | 20                                                                         |
| 3    | Final project report/presentation     | 70<br>(project coordinator =10<br>supervisor =20<br>external examiner =40) |
|      | <b>Total</b>                          | <b>100</b>                                                                 |

#### **Detailed evaluation scheme:**

| S.N. | Topic | Marks Distribution |
|------|-------|--------------------|
|------|-------|--------------------|

|   |                                                  |             |
|---|--------------------------------------------------|-------------|
| 1 | Presentation skill                               | 20%         |
| 2 | Team work                                        | 10%         |
| 3 | Understanding of project work and related theory | 20%         |
| 4 | Project demonstration                            | 20%         |
| 5 | Project Applications                             | 10%         |
| 6 | Documentation                                    | 20%         |
|   | <b>Total</b>                                     | <b>100%</b> |

**Third Year/ Second Part**

| <b>S.N.</b> | <b>Course Code</b> | <b>Subject</b>                       |
|-------------|--------------------|--------------------------------------|
| 1           | EG3201CT           | Multimedia System                    |
| 2           | EG3202CT           | Internet of Things                   |
| 3           | EG3201MG           | Entrepreneurship Development         |
| 4           | EG3201IT           | Cyber Security                       |
| 5           |                    | Elective-II                          |
|             | EG3202IT.1         | a) E-commerce                        |
|             | EG3202IT.2         | b) Mobile Application Development    |
|             | EG3202IT.3         | c) Telecommunication                 |
|             | EG3202IT.4         | d) Network and System Administration |
| 6           | EG3203IT           | Major Project                        |

**Multimedia System**  
EG3201CT

**Year: III**  
**Part: II**

**Total: 6 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hours/week**  
**Practical: hours/week**  
**Lab: 2 hours/week**

**Course description:**

The main objective of this course is to give the fundamental knowledge of multimedia technologies and cover three main domains of Multimedia Systems: Devices, Systems and applications

**Course objectives:**

After completion of this course students will be able to:

1. Identify basics of multimedia and multimedia system and its architecture.
2. Understand different multimedia components.
3. Explain file formats for different multimedia components.
4. Analyze the different compression algorithms.
5. Apply different Designing techniques in multimedia system

**Course Contents:**

**Theory**

|                                                                          |                 |
|--------------------------------------------------------------------------|-----------------|
| <b>Unit 1. Introduction</b>                                              | <b>[4 Hrs.]</b> |
| 1.1. Definition                                                          |                 |
| 1.2. Uses of multimedia                                                  |                 |
| 1.3. Components of multimedia                                            |                 |
| 1.4. Multimedia building blocks                                          |                 |
| 1.5. Multimedia and Personalized Computing                               |                 |
| 1.6. Medium                                                              |                 |
| 1.7. Multimedia system and properties                                    |                 |
| 1.8. Data Streams Characteristics                                        |                 |
| 1.9. Data Stream Characteristics for Continuous Media, Information Units |                 |
| <b>Unit 2. Sound / Audio System</b>                                      | <b>[3 Hrs.]</b> |
| 2.1. Concepts of sound system                                            |                 |
| 2.2. Music and speech                                                    |                 |
| 2.3. Speech Generation                                                   |                 |
| 2.4. Speech Analysis                                                     |                 |
| 2.5. Speech Transmission                                                 |                 |
| <b>Unit 3. Images and Graphics</b>                                       | <b>[4 Hrs.]</b> |
| 3.1. Digital Image Representation                                        |                 |
| 3.2. Image and graphics Format                                           |                 |
| 3.3. Image Synthesis                                                     |                 |
| 3.4. Analysis and Transmission                                           |                 |
| <b>Unit 4. Video and Animation</b>                                       | <b>[4 Hrs.]</b> |
| 4.1. Video signal representation                                         |                 |
| 4.2. Computer- Based animation                                           |                 |
| 4.3. Animation Language                                                  |                 |

|                 |                                            |                 |
|-----------------|--------------------------------------------|-----------------|
| 4.4.            | Methods of controlling Animation           |                 |
| 4.5.            | Display of Animation                       |                 |
| 4.6.            | Transmission of Animation                  |                 |
| <b>Unit 5.</b>  | <b>Multimedia Applications Development</b> | <b>[4 Hrs.]</b> |
| 5.1.            | Multimedia systems development cycle       |                 |
| 5.2.            | Planning and costing                       |                 |
| 5.3.            | Designing                                  |                 |
| 5.4.            | Developing and producing                   |                 |
| 5.5.            | Testing and debugging                      |                 |
| 5.6.            | Delivering                                 |                 |
| 5.7.            | User Interface techniques                  |                 |
| <b>Unit 6.</b>  | <b>Data Compression</b>                    | <b>[4 Hrs.]</b> |
| 6.1.            | Need for data compression                  |                 |
| 6.2.            | Compression basics                         |                 |
| 6.3.            | Lossless compression                       |                 |
| 6.4.            | Lossy compression                          |                 |
| 6.5.            | LZW Compression                            |                 |
| <b>Unit 7.</b>  | <b>Designing Multimedia</b>                | <b>[4 Hrs.]</b> |
| 7.1.            | Development phases and development team    |                 |
| 7.2.            | Analysis phase                             |                 |
| 7.3.            | Design phase                               |                 |
| 7.4.            | Development phase                          |                 |
| 7.5.            | Implementation phase                       |                 |
| 7.6.            | Evaluation and testing phase               |                 |
| <b>Unit 8.</b>  | <b>Application Subsystem</b>               | <b>[4 Hrs.]</b> |
| 8.1.            | Application Subsystem                      |                 |
| 8.2.            | Transport subsystem                        |                 |
| 8.3.            | Quality of service and resource management |                 |
| 8.4.            | Trends in collaborative Computing          |                 |
| 8.5.            | Trends in Transport Systems                |                 |
| 8.6.            | Multimedia Database Management System      |                 |
| <b>Unit 9.</b>  | <b>User Interface</b>                      | <b>[3 Hrs.]</b> |
| 9.1.            | Basic Design Issues,                       |                 |
| 9.2.            | Video and Audio at the User Interface      |                 |
| 9.3.            | User- friendliness as the Primary Goal     |                 |
| <b>Unit 10.</b> | <b>Synchronization</b>                     | <b>[4 Hrs.]</b> |
| 10.1.           | Notation of Synchronization                |                 |
| 10.2.           | Presentation Requirements                  |                 |
| 10.3.           | Model for Multimedia Synchronization,      |                 |
| 10.4.           | Specification of Synchronization           |                 |
| <b>Unit 11.</b> | <b>Abstraction for programming</b>         | <b>[4 Hrs.]</b> |
| 11.1.           | Abstractions Levels                        |                 |
| 11.2.           | Libraries                                  |                 |

- 11.3. System Software
- 11.4. Toolkits
- 11.5. Higher Programming Languages
- 11.6. Object –oriented approaches

## **Unit 12. Multimedia Application**

**[3 Hrs.]**

- 12.1. Program and Structure
- 12.2. Media Preparation
- 12.3. Media Composition
- 12.4. Media Integration
- 12.5. Media Communication
- 12.6. Media Consumption
- 12.7. Media Entertainment
- 12.8. Trends in multimedia applications

### **Practical:**

**[30 Hrs.]**

Lab exercises are as follows:

1. To edit various format of Images and give the various effects in images using Adobe Photoshop
2. Vector-based drawing application using Macromedia FreeHand
3. To create different types of animation, use the action script to control the various objects using Macromedia Flash and swish Max
4. To edit and publish the movie in various formats using Adobe Premiere
5. To integrate all the multimedia objects like audio, video, images etc. and will able to create different interactive presentations using Macromedia Director

| <b>Final written exam evaluation scheme</b> |                                     |              |                            |
|---------------------------------------------|-------------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                        | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Introduction                        | 4            | 7                          |
| 2                                           | Sound / Audio System                | 3            | 6                          |
| 3                                           | Images and Graphics                 | 4            | 7                          |
| 4                                           | Video and Animation                 | 4            | 7                          |
| 5                                           | Multimedia Applications Development | 4            | 7                          |
| 6                                           | Data Compression                    | 4            | 7                          |
| 7                                           | Designing Multimedia                | 4            | 7                          |
| 8                                           | Application Subsystem               | 4            | 7                          |
| 9                                           | User Interface                      | 3            | 6                          |
| 10                                          | Synchronization                     | 4            | 7                          |
| 11                                          | Abstraction for programming         | 4            | 7                          |
| 12                                          | Multimedia Application              | 3            | 5                          |
| <b>Total</b>                                |                                     | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

### **References:**

1. Multimedia: Computing, Communications and Applications, Ralf Steinmetz and Klara Nahrstedt, Pearson Education Asia
2. Multimedia Communications, Applications, Networks, Protocols and Standards, Fred Halsall, Pearson Education Asia
3. Multimedia Systems, John F. Koegel Buford, Pearson Education Asia
4. Multimedia Technologies, Ashok Banerji, Ananda Mohan Ghosh, Tata McGraw Hill

**Internet of Things**  
EG3202CT

**Year: III**

**Part: II**

**Total: 7 hours /week**

**Lecture: 3 hours/week**

**Tutorial: 1 hours/week**

**Practical: hours/week**

**Lab: 3 hours/week**

**Course description:**

This course provides theoretical as well as practical knowledge of fundamentals of Internet of Things (IoT) to make students capable of designing, implementing and managing the issues of IoT in their personal as well professional life.

**Course objectives:**

After completion of this course students will be able to:

1. Design and implement fundamentals of IoT.
2. Manage privacy and security issues related to IoT.

**Course Contents:**

**Theory**

**Unit 1. Introduction**

**[6 Hrs.]**

- 1.1. Definition
- 1.2. History of IoT
- 1.3. IoT Architecture
- 1.4. IoT Frameworks
- 1.5. Benefits of IoT
- 1.6. Applications of IoT

**Unit 2. Fundamental Mechanisms and Key Technologies**

**[8 Hrs.]**

- 2.1. Identification of IoT Objects and Services
- 2.2. Structural Aspects of the IoT
- 2.3. Environment Characteristics
- 2.4. Traffic Characteristics
- 2.5. Scalability
- 2.6. Interoperability
- 2.7. Security and Privacy
- 2.8. Open Architecture
- 2.9. Key IoT Technologies
- 2.10. Device Intelligence
- 2.11. Communication Capabilities
- 2.12. Mobility Support
- 2.13. Device Power
- 2.14. Sensor Technology
- 2.15. RFID Technology
- 2.16. Satellite Technology

**Unit 3. IoT Protocols**

**[6 Hrs.]**

- 3.1. Protocol Standardization for IoT
- 3.2. Efforts
- 3.3. M2M and WSN Protocols
- 3.4. SCADA and RFID Protocols
- 3.5. Unified Data Standards – Protocols

- 3.6. IEEE 802.15.4
- 3.7. BACNet Protocol
- 3.8. Modbus
- 3.9. Zigbee Architecture
- 3.10. Network layer
- 3.11. LowPAN
- 3.12. CoAP
- 3.13. Security

#### **Unit 4. IoT with RASPBERRY PI**

**[9 Hrs.]**

- 4.1. Building IOT with RASPBERRY PI
- 4.2. IoT Systems
- 4.3. Logical Design using Python
- 4.4. IoT Physical Devices & Endpoints
- 4.5. IoT Device
- 4.6. Building blocks
- 4.7. Raspberry Pi -Board
- 4.8. Linux on Raspberry Pi
- 4.9. Raspberry Pi Interfaces
- 4.10. Programming Raspberry Pi with Python

#### **Unit 5. IoT Privacy, Security and Governance**

**[6 Hrs.]**

- 5.1. Vulnerabilities of IoT
- 5.2. Security requirements
- 5.3. Threat analysis
- 5.4. Use cases and misuse cases
- 5.5. IoT security tomography and layered attacker model
- 5.6. Identity establishment
- 5.7. Access control
- 5.8. Message integrity
- 5.9. Non-repudiation and availability
- 5.10. Security model for IoT

#### **Unit 6. REAL-WORLD APPLICATIONS and CASE STUDIES**

**[10 Hrs.]**

- 6.1. Real world design constraints and challenges
- 6.2. Applications and Asset management
- 6.3. Industrial automation
- 6.4. Smart Metering Advanced Metering Infrastructure
- 6.5. Smart grid
- 6.6. e-Health Body Area Networks
- 6.7. Commercial building automation
- 6.8. Smart cities - participatory sensing
- 6.9. Data Analytics for IoT
- 6.10. Software & Management Tools for IoT
- 6.11. Cloud Storage Models & Communication
- 6.12. APIs
- 6.13. Cloud for IoT
- 6.14. Amazon Web Services for IoT

#### **Practical:**

**[45 Hrs.]**

- 1. To Implement the IoT Frameworks

2. To Implement Cloud Storage Models & Communication
3. Interfacing sensors to Raspberry
4. Interfacing Arduino to Bluetooth Module
5. Communicate between Arduino and Raspberry PI using any wireless medium
6. To Design an IOT based system

| <b>Final written exam evaluation scheme</b> |                                             |              |                            |
|---------------------------------------------|---------------------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                                | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Introduction                                | 6            | 11                         |
| 2                                           | Fundamental Mechanisms and Key Technologies | 8            | 14                         |
| 3                                           | IoT Protocols                               | 6            | 11                         |
| 4                                           | IoT with RASPBERRY PI                       | 9            | 15                         |
| 5                                           | IoT Privacy, Security and Governance        | 6            | 11                         |
| 6                                           | REAL-WORLD APPLICATIONS and CASE STUDIES    | 10           | 18                         |
|                                             | <b>Total</b>                                | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

#### **References:**

1. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications
2. ArshdeepBahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011. 3.
4. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
5. Jan Höller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
6. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012
7. HakimaChaouchi, "The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Willy Publications
8. Daniel Kellmereit, Daniel Obodovski, "The Silent Intelligence: The Internet of Things",. Publisher: Lightning Source Inc; 1 edition (15 April 2014). ISBN-10: 0989973700, ISBN-13: 978- 0989973700. 4. Fang Zhaho, Leonidas Guibas, "Wireless Sensor Network: An information processing approach", Elsevier, ISBN: 978-81-8147-642-5.

**Entrepreneurship Development**  
**EG 3201 MG**

**Year: III**  
**Semester: II**

**Total: 5 Hrs. /week**  
**Lecture: 3 Hrs./week**  
**Tutorial: Hr./week**  
**Practical: 2 Hrs./week**  
**Lab: Hrs./week**

**Course Description:**

This course is designed to provide the knowledge and skills on formulating business plan and managing small business. The entire course deals with assessing, acquiring, and developing entrepreneurial attitude; skills and tools that are necessary to start and run a small enterprise.

**Course Objectives:**

After completion of this course students will be able to:

1. Understand the concept of business and entrepreneurship;
2. Explore entrepreneurial competencies;
3. Analyze business ideas and viability;
4. Learn to formulate business plan with its integral components and
5. Manage small business.

**Course Contents:**

**Theory**

**Unit 1: Introduction to Business & Entrepreneurship: [9 Hrs.]**

- 1.1 Overview of entrepreneur and entrepreneurship
- 1.2 Wage employment, self- employment and business
- 1.3 Synopsis of types and forms of enterprises
- 1.4 Attitudes, characteristics & skills required to be an entrepreneur
- 1.5 Myths about entrepreneurs
- 1.6 Overview of MSMEs (Micro, Small and Medium Enterprises) in Nepal

**Unit 2: Exploring and Developing Entrepreneurial Competencies: [9 Hrs.]**

- 2.1 Assessing individual entrepreneurial inclination
- 2.2 Assessment of decision-making attitudes
- 2.3 Risk taking behavior and risk minimization
- 2.4 Creativity and innovation in business
- 2.5 Enterprise management competencies

**Unit 3: Business identification and Selection: [4 Hrs.]**

- 3.1 Sources and method of finding business idea(s)
- 3.2 Selection of viable business ideas
- 3.3 Legal provisions for MSMEs in Nepal

**Unit 4: Business plan Formulation:****[18 Hrs.]**

- 4.1 Needs and importance of business plan
- 4.2 Marketing plan
  - Description of product or service
  - Targeted market and customers
  - Location of business establishment
  - Estimation of market demand
  - Competitors analysis
  - Estimation of market share
  - Measures for business promotion
- 4.3 Business operation plan
  - Process of product or service creation
  - Required fix assets
  - Level of capacity utilization
  - Depreciation & amortization
  - Estimation office overhead and utilities
- 4.4 Organizational and human resource plan
  - Legal status of business
  - Management structure
  - Required human resource and cost
  - Roles and responsibility of staff
- 4.5 Financial plan
  - Working capital estimation
  - Pre-operating expenses
  - Source of investment and financial costs
  - Per unit cost of service or product
  - Unit price and profit/loss estimation of first year
- 4.6 Business plan appraisal
  - Return on investment
  - Breakeven analysis
  - Risk factors

**Unit 5: Small Business Management:****[5 Hrs.]**

- 5.1 Concept of small business management
- 5.2 Market and marketing mix
- 5.3 Basic account keeping

## **Practical**

- Unit 1: Overview of Business & Entrepreneurship** [2 Hrs.]
1. Collect business information through interaction with successful entrepreneur
- Unit 2: Exploring and Developing Entrepreneurial Competencies** [2 Hrs.]
- Generate innovative business ideas
- Unit 3: Product or service Identification and Selection** [2 Hrs.]
1. Analyze business ideas using SWOT method
- Unit 4: Business Plan Formulation** [22 Hrs.]
1. Prepare marketing plan
  2. Prepare operation plan
  3. Prepare organizational and human resource plan
  4. Prepare financial plan
  5. Appraise business plan
  6. Prepare action plan for business startup
- Unit 5: Small Business Management** [2 Hrs.]
1. Prepare receipt and payment account
  2. Perform costing and pricing of product and service

**Cyber Security**  
EG3201IT

**Year: III**  
**Part: II**

**Total: 5 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: hour/week**  
**Practical: hours/week**  
**Lab: 2 hours/week**

**Course Description:**

This course is designed to provide the knowledge of fundamental aspects of Cyber Security and professional ethics in cyber world. Security is also an essential part of e-Enable Services, in the enterprise and over networks has become the primary concern. The course will provide knowledge to the students about how information can be protected throughout application, organization and computer networks and will help them to understand the social and professional cultural, social, legal, and ethical issues as well. The student will discuss on different types of cyber security issues, secure techniques, security and cryptography, legal issues in cybercrime, incidents and cyber forensic, ethical issues in cyber world, Professional ethics and Risk and liability in the computer-based System.

**Course objectives:**

After completion of this course students will be able to:

1. Gain the knowledge of different types of cyber threats and issues in computer application, organization and networks.
2. Gain familiarity with prevalent application, network and distributed system attacks, defenses against them, and forensics to investigate.
3. Develop a basic understanding of cryptography
4. Develop an understanding of security policies such as authentication, integrity and confidentiality as well as protocols to implement.

**Course Contents:**

**Theory**

**Unit 1. Introduction** **[6 Hrs.]**

- 1.1. Information System
- 1.2. Cyber Threats and it types
- 1.3. Cyber Crimes
- 1.4. Cyber Security and its categories
- 1.5. Types of Attacks in cyber

**Unit 2. Security Technologies** **[7 Hrs.]**

- 2.1. Virtual Private Network
- 2.2. Encryptions/Decryption
- 2.3. Intrusion Detection and protection system
- 2.4. Anti-Malicious Software
- 2.5. Security Software and Browser Security
- 2.6. Firewalls

**Unit 3. Information Security and Cryptography** **[7 Hrs.]**

- 3.1. Cryptography basics
- 3.2. Classical Encryption/Decryption Method

- 3.3. Types of cryptography (RSA, DES and AES)
- 3.4. Asymmetric Key Cryptography
- 3.5. Digital Signature

**Unit 4. Legal Issues in Cyber Crime** **[5 Hrs.]**

- 4.1. Legal Issues in Information Security
- 4.2. Cyber Law
- 4.3. Security Policy
- 4.4. Managing Risk
- 4.5. Information Security Process

**Unit 5. Forensics and Incident Analysis** **[8 Hrs.]**

- 5.1. Forensic Technologies
- 5.2. Digital Evidence Collection
- 5.3. Evidentiary Reporting
- 5.4. Incident Preparation
- 5.5. Incident Detection and Analysis
- 5.6. Containment, Eradication, and Recovery
- 5.7. Proactive and Post Incident Cyber Services

**Unit 6. Application Security** **[3 Hrs.]**

- 6.1. Types
- 6.2. Security in cloud
- 6.3. Mobile application security
- 6.4. Web application security

**Unit 7. Professional and Ethical Responsibilities** **[9 Hrs.]**

- 7.1. Privacy
- 7.2. Ethical issues in cyber security
- 7.3. Ethical challenges for cyber security professionals
- 7.4. Intellectual Property
- 7.5. Professional Ethics
- 7.6. Freedom of Speech
- 7.7. Fair User and Ethical Hacking
- 7.8. Trademarks
- 7.9. Internet Fraud
- 7.10. Electronic Evidence
- 7.11. Community values and the laws by which we live
- 7.12. The nature of professionalism in IT
- 7.13. Various forms of professional credentialing
- 7.14. The role of the professional in public policy
- 7.15. Maintaining awareness of consequences
- 7.16. Ethical dissent and whistle-blowing
- 7.17. Codes of ethics, conduct, and practice (IEEE, ACM, SE, AITP, and so forth)
- 7.18. Electronic Transaction Act of Nepal

**Practical:** **[30 Hrs.]**

- 1. Installation of Firewall
- 2. Blocking and unblocking of websites using Firewall
- 3. Implement different cryptographic algorithm (RSA, DES, AES)

4. Implement Access control
5. Implement Digital Signature
6. Installation of VPN and use VPN server.
7. Use of cypher text for encryption.

| Final written exam evaluation scheme |                                           |           |                     |
|--------------------------------------|-------------------------------------------|-----------|---------------------|
| Unit                                 | Title                                     | Hours     | Marks Distribution* |
| 1                                    | Introduction                              | 6         | 11                  |
| 2                                    | Security Technologies                     | 7         | 12                  |
| 3                                    | Information Security and Cryptography     | 7         | 12                  |
| 4                                    | Legal Issues in Cyber Crime               | 5         | 9                   |
| 5                                    | Forensics and Incident Analysis           | 8         | 14                  |
| 6                                    | Application Security                      | 3         | 6                   |
| 7                                    | Professional and ethical responsibilities | 9         | 16                  |
|                                      | <b>Total</b>                              | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

#### References:

1. Eric Maiwald, Fundamentals of Network Security, McGraw-Hill Education
2. Patel, D. R. (2008). *Information security: theory and practices*. New Delhi: Prentice-Hall of India.
3. Social, Legal and Ethical Issues for Computers and the Internet by Sara Baase.
4. Ethics of Computing: Codes, spaces for discussion and law by Jacques Berleur and Klaus Brunnstein Chapman & Hall.
5. Joseph Migga Kizza, Ethical and Social Issues in the Information Age

**E-commerce**  
(Elective II)  
EG3202IT.1

**Year: III**  
**Part: II**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: 0 hours/week**  
**Lab: 3 hours/week**

**Course Description:**

This course aims to guide the students in both the theoretical and practical aspects of developing computer solutions for real-world problems. This course deals with the introduction, different business models for e-Commerce, concept of mobile computing, different types of on-line business systems, techniques and implementation for electronics payment system, and legal considerations in e-Commerce.

**Course Objectives:**

After completing this course, the students will be able to

1. Explain the steps required to set-up your E-commerce website for advertising purposes
2. Introduce the e-commerce.
3. Identify security issues of e-Commerce and e-commerce related Public Policy.
4. Explain the types of payment system and payment gateway.
5. Describe the legal and ethical issues of e-commerce and cyber law.
6. Familiarize with online marketing.

**Course Contents:**

**Theory**

**Unit 1. Fundamental concept of e-Commerce** **[6 Hrs.]**

- 1.1. Definition of Electronic Commerce
- 1.2. Scope of Electronic Commerce
- 1.3. Electronic E-commerce and the Trade Cycle
- 1.4. Emergence of Internet and commercial use of Internet
- 1.5. E-commerce Models, Personal web server, Internet information server, ASP page Contain scripts, Contain objects and components, Database access
- 1.6. Application of E-Commerce

**Unit 2. Business Models of e-Commerce** **[6 Hrs.]**

- 2.1. Business to Business (B2B)
- 2.2. Business to Consumer (B2C)
- 2.3. Consumer to Consumer (C2C)
- 2.4. Development of B2B e-commerce
- 2.5. Difference between B2C and B2B e-Commerce
- 2.6. e-Procurement
- 2.7. Just in Time Delivery
- 2.8. Integration with Back-end Information System
- 2.9. Electronic marketing in Business-to-Business
- 2.10. Electronic Data Interchange (EDI)
- 2.11. EDI: The Nuts and Bolts, EDI & Business
- 2.12. Auctions and Services from Traditional to Internet Based EDI

- Unit 3. E-marketing and Advertising Concepts** [5 Hrs.]
- 3.1. Define E-marketing
  - 3.2. Explain Traditional Marketing
  - 3.3. Online Marketing vs offline marketing
  - 3.4. Tools for online and offline marketing
  - 3.5. Issues with online marketing
  - 3.6. Model of an online video store
- Unit 4. Mobile and Wireless Application** [5 Hrs.]
- 4.1. Define Mobile and wireless
  - 4.2. Growth of Mobile Commerce
  - 4.3. Wireless Application Protocol (WAP)
  - 4.4. Use of technologies for mobile commerce
  - 4.5. Architecture of Wireless Application Protocol
  - 4.6. Generations in Wireless Communications
  - 4.7. Security Issues related to Wireless Communication
- Unit 5. The network infrastructure for e-commerce** [8 Hrs.]
- 5.1. Network and internets
  - 5.2. Network routers
  - 5.3. Internet protocol suites
  - 5.4. Internet naming convention, (URLs, TCP, FTP, ISP, Telnet, Search engine)
  - 5.5. Broadband technologies (ADSL, Wi-Fi, LTE (4G), Bluetooth)
  - 5.6. Web-based client/server
  - 5.7. Software agents, Types of software agents,
  - 5.8. Internet Security
  - 5.9. Multimedia delivery
  - 5.10. Managerial issues
- Unit 6. Electronic Payment System (EPS)** [4 Hrs.]
- 6.1. Define Electronic payment system
  - 6.2. Types of electronic payment system
  - 6.3. Digital token-based E-payment system
  - 6.4. Smart Cards & E-payment systems
  - 6.5. Credit card-based payment systems
  - 6.6. Digital wallet (eSewa, Khalti, ConnectIPS)
  - 6.7. Online banking facilities of banks (Nepali banks)
  - 6.8. Risk factor in electronic payment system
- Unit 7. Introduction to Entrepreneurship** [6 Hrs.]
- 7.1. Entrepreneurship development
  - 7.2. Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager
  - 7.3. Attributes and characteristics of a successful Entrepreneur
  - 7.4. Entrepreneurial Culture
  - 7.5. Legal and Ethical Issues
- Unit 8. Public Policy** [5 Hrs.]
- 8.1. From legal issues to privacy
  - 8.2. E-commerce related legal incidents

- 8.3. Ethical and other public policy issues
- 8.4. Protecting privacy
- 8.5. Protecting intellectual property
- 8.6. Internet indecency and censorship
- 8.7. Taxation and encryption policies
- 8.8. E-commerce Law
- 8.9. Forms of Agreement
- 8.10. Government policies

**Practical:**

**[45 Hrs.]**

1. Project should be done by students in any e-commerce site (the project should include: business model, payment mode, network infrastructure, marketing strategy, SWOT analysis and working process of site) (Refer Amazon, Alibaba, E-bay, Paypal etc.)
2. Study visit to fully developed E-Commerce management organization.

| <b>Final written exam evaluation scheme</b> |                                           |              |                            |
|---------------------------------------------|-------------------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                              | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Fundamental concept of E-Commerce         | 6            | 11                         |
| 2                                           | Business Models of e-Commerce             | 6            | 11                         |
| 3                                           | E-marketing and Advertising Concepts      | 5            | 9                          |
| 4                                           | Mobile and Wireless Application           | 5            | 9                          |
| 5                                           | The network Infrastructure for E-commerce | 8            | 13                         |
| 6                                           | Electronic Payment System (EPS)           | 4            | 7                          |
| 7                                           | Introduction to Entrepreneurship          | 6            | 11                         |
| 8                                           | Public Policy                             | 5            | 9                          |
|                                             | <b>Total</b>                              | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

**References:**

1. Noel Jerke, April 2012. E-Commerce Developer's Guide to Building Community and using Promotional Tools. Sybex Inc.
2. Kenneth C. Laudon and Carol Guercio Traver, (11<sup>th</sup> edition), 2015. E-commerce 2015 business, technology, society. Pearson
3. Janice Reynolds, (2nd edition, 2015. The Complete E-Commerce Book, Design, Build & Maintain a Successful Web-based Business. Focal Press
4. Amir Manzoor, (1<sup>st</sup> edition), 2015. E-commerce 2016. Printed in the United States of America.

**Mobile Application Development**  
(Elective II)  
EG3202IT.2

**Year: III**  
**Part: II**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: 0 hours/week**  
**Lab: 3 hours/week**

**Course description:**

This course is designed to develop the mobile application for the Android platform. The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language. Students will learn skills for creating and deploying Android application with Create Application, design user Interface, Intents, Broadcast Receivers, Adapters, Data Storage, Retrieval, Sharing, Maps, Geo-coding, and Location-Based Services, Peer-to-Peer Communication, Hardware Interfacing and finally publish it on Google Play Store.

**Course objectives:**

After the completion of this course, the students should be able to: -

1. Gain a good understanding of the basic concept of mobile technology and mobile operating system.
2. Develop android based mobile apps using Android SDK tool kits.
3. Use various Layouts and Widgets in Android Applications.
4. Create interactive applications in android with multiple activities including audio, video and notifications.
5. Deploy applications to the Android marketplace for distribution.

**Course Contents:**

**Theory**

**Unit 1. Introduction**

**[3 Hrs.]**

- 1.1. Mobile and Wireless
- 1.2. Mobile devices, Screen resolution and Touch interfaces
- 1.3. App Store, Google Play, Windows Store
- 1.4. Development environments
- 1.5. Mobile OS Architecture
- 1.6. History of Android
- 1.7. Versions and API levels of Android
- 1.8. Android Development Tools
- 1.9. Environments Set up

**Unit 2. Application and User Interface**

**[6 Hrs.]**

- 2.1. Creating Applications and Activities
- 2.2. Introducing the Application Manifest
- 2.3. The Android Application Life Cycle
- 2.4. Runtime Configuration Changes
- 2.5. Fundamental Android UI Design and user interface
- 2.6. The Android Widget Toolbox
- 2.7. Introducing Layouts
- 2.8. Creating and modify Views

- 2.9. Creating Custom Widgets and Controls
- 2.10. Using Custom Controls
- 2.11. Creating and Using Menu
- 2.12. Submenus and Context Menus

**Unit 3. Intents, Broadcast Receivers, Adapters, and the Internet [6 Hrs.]**

- 3.1. Introducing Intents
- 3.2. Using Intents to Launch Activities
- 3.3. Using Intent Filters for Plug-ins and Extensibility
- 3.4. Using Intents to Broadcast Events
- 3.5. Introducing Adapters
- 3.6. Using Adapters for Data Binding
- 3.7. Using Internet Resources
- 3.8. Connecting to an Internet Resource
- 3.9. Introducing Dialogs
- 3.10. Using Activities as Dialogs

**Unit 4. Data Storage, Retrieval, and Sharing [8 Hrs.]**

- 4.1. Android Techniques for Saving Data
- 4.2. Saving Simple Application Data
- 4.3. Creating and Saving Preferences
- 4.4. Retrieving Shared Preferences
- 4.5. Saving the Activity State
- 4.6. Saving and Loading Files
- 4.7. File Management Tools
- 4.8. Databases in Android
- 4.9. Introducing SQLite
- 4.10. Cursors and Content Values
- 4.11. Working with Android Databases
- 4.12. Introducing Content Providers
- 4.13. Using Content Providers

**Unit 5. Views, Animation and Fragments [4 Hrs.]**

- 5.1. Views in Android
- 5.2. Types of views: List view and Grid view
- 5.3. Implementing list view and grid view
- 5.4. Android animations
- 5.5. Implementing various types of animations
- 5.6. Fragments in android

**Unit 6. Maps, Geo-coding, and Location-Based Services [6 Hrs.]**

- 6.1. Using Location-Based Services
- 6.2. Selecting a Location Provider
- 6.3. Finding the Available Providers
- 6.4. Finding Your Location
- 6.5. Tracking Movement
- 6.6. Using Proximity Alerts
- 6.7. Using the Geo-coder
- 6.8. Creating Map -Based Activities
- 6.9. Creating a Map-Based Activity

- 6.10. Using the Map Controller
- 6.11. Creating and Using Overlays

**Unit 7. Working in the Background [6 Hrs.]**

- 7.1. Introducing Services
- 7.2. Creating and Controlling Services
- 7.3. Binding Activities to Services
- 7.4. Customizing Toasts
- 7.5. Using Toasts in Worker Threads
- 7.6. Introducing Notifications
- 7.7. Creating Notifications
- 7.8. Triggering Notifications
- 7.9. Using Alarms

**Unit 8. Peer-to-Peer Communication and Hardware Interfacing [4 Hrs.]**

- 8.1. Introducing Android Instant Messaging
- 8.2. Managing Chat Sessions
- 8.3. Sending and Receiving Data Messages
- 8.4. Introducing SMS
- 8.5. Using the Media APIs
- 8.6. Playing Media Resources
- 8.7. Using the Camera
- 8.8. Introducing the Sensor Manager
- 8.9. Android Telephony
- 8.10. Using Bluetooth
- 8.11. Managing Network and Wi-Fi Connections

**Unit 9. Publishing apps [2 Hrs.]**

- 9.1. Preparing for publishing
- 9.2. Publishing to the Android Market

**Practical: [45 Hrs.]**

- 1. Learning the Basics [6 Hrs.]
  - 1.1. Setting up the Development Environment
  - 1.2. Create a "Hello World" Android Application
  - 1.3. Install and run the application on a physical device
  - 1.4. Create a simple user interface
- 2. Implementing layouts and views [8 Hrs.]
  - 2.1. Demonstrate different positions of relative layouts
  - 2.2. Demonstrate views and views group
  - 2.3. Use events and event listeners
- 3. Using Adapters [6 Hrs.]
  - 3.1. Declare layouts statically as an xml resource
  - 3.2. Create Options and Context Menus
  - 3.3. Use Adapters and Adapter Views to bind a View class to data
- 4. Saving data and using database [8 Hrs.]
  - 4.1. Save & restore data as Application Preferences
  - 4.2. Create an SQLite Database
  - 4.3. Manage database connections
  - 4.4. Insert, update, remove, and retrieve data from an SQLite Database

5. Using Animations [2 Hrs.]
  - 5.1. Demonstrate different types of animations
6. Implement Maps [8 Hrs.]
  - 6.1. Incorporate Google Maps into an application
  - 6.2. Register for and receive GPS location information
  - 6.3. Create Google Maps Overlays
7. Using Intents [3 Hrs.]
  - 7.1. Create and use Content Providers
  - 7.2. Create and use Services
  - 7.3. Broadcast Intents
8. Using Sensors and SMS [2 Hrs.]
  - 8.1. Send SMS text messages.
  - 8.2. Register to receive information from a device's available sensors.
  - 8.3. Monitor the motion of a physical device.
9. Publishing apps [2 Hrs.]
  - 9.1. Publish app to play store

| Final written exam evaluation scheme |                                                          |           |                     |
|--------------------------------------|----------------------------------------------------------|-----------|---------------------|
| Unit                                 | Title                                                    | Hours     | Marks Distribution* |
| 1                                    | Introduction                                             | 3         | 5                   |
| 2                                    | Application and User Interface                           | 6         | 10                  |
| 3                                    | Intents, Broadcast Receivers, Adapters, and the Internet | 6         | 10                  |
| 4                                    | Data Storage, Retrieval, and Sharing                     | 8         | 20                  |
| 5                                    | Views, Animation and Fragments                           | 4         | 5                   |
| 6                                    | Maps, Geo-coding, and Location-Based Services            | 6         | 10                  |
| 7                                    | Working in the Background                                | 6         | 10                  |
| 8                                    | Peer-to-Peer Communication and Hardware Interfacing      | 4         | 5                   |
| 9                                    | Publishing apps                                          | 2         | 5                   |
|                                      | <b>Total</b>                                             | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

#### References:

1. Meier, R. (2009). Professional Android application development. Indianapolis, India: Wiley.
2. Kothari, Pradeep. (2014). Android Application Development, Black Book Paperback, Dreamtech Press, India
3. Barry Burd, (2015). Android Application Development All-in-One for Dummies. Wiley India Private Limited

**Telecommunication**  
(Elective II)  
EG3202IT.3

**Year: III**  
**Part: II**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: 0 hours/week**  
**Lab: 3 hours/week**

**Course description:**

This course covers introduction to basic communication and telephone system, EPABX system, long distance communication, soft switching access network & transmission network, mobile and wireless communication are also included.

**Course Objectives:**

After completing this course, the students will be able to

1. Familiarize telephony system and soft switching system.
2. Install PABX system.
3. Explain wireless / mobile communication system.

**Course Contents:**

**Theory**

**Unit 1. Introduction** **[6 Hrs.]**

- 1.1. History of communication system
- 1.2. Transmission Media
  - 1.2.1. Flexible cables
  - 1.2.2. PVC cables
  - 1.2.3. Communication Cable /LAN Cables (STP, UTP, Fiber Optics)
  - 1.2.4. Metallic & Non-metallic Sheathed Cable
- 1.3. Types of radio communication system:
  - 1.3.1. Telephony
  - 1.3.2. Broadcasting of audio and visual information
  - 1.3.3. Radio navigation
  - 1.3.4. Satellite communication
- 1.4. Switching system:
  - 1.4.1. Rotary dial Telephone
  - 1.4.2. Strowger switching system
  - 1.4.3. Principles of crossbar switching
  - 1.4.4. Crossbar switch configuration

**Unit 2. Telephone Switching System** **[8 Hrs.]**

- 2.1. Introduction
  - 2.1.1. Telephone channel
  - 2.1.2. Group, super group, master group, super master group
  - 2.1.3. Switching: Stored program control, Software architecture Application software, Centralized SPC and Distributed SPC
  - 2.1.4. Service Networks:
    - 2.1.4.1. Two stage Networks
    - 2.1.4.2. Three stage Networks
    - 2.1.4.3. N Stage Networks

- 2.2. Basic time division space switching and Time multiplexed space switching
- 2.3. Basic time division Time switching and Time multiplexed time switching
- 2.4. Combination switching

### **Unit 3. Data Networks and Operation**

**[9 Hrs.]**

- 3.1. Introduction
- 3.2. Initial Design Considerations
  - 3.2.1. Data Terminals, Workstations, PCs, and Servers
- 3.3. Network Topologies and Configurations
- 3.4. Overview of Data Switching
  - 3.4.1. Traffic Engineering- A Modified Meaning
  - 3.4.2. Packet Networks and Packet Switching
  - 3.4.3. Interior Gateway Routing Protocol (IGRP)
- 3.5. TCP/IP and Related Protocols
  - 3.5.1. TCP/IP and Data-Link Layers
  - 3.5.2. The IP Routing Function
  - 3.5.3. The Transmission Control Protocol (TCP)
  - 3.5.4. Brief Overview of Internet Protocol Version 6 (IPV6)
- 3.6. Virtual Private Networks (VPNs)
  - 3.6.1. Introduction to VPNs
  - 3.6.2. Two Major Requirements
  - 3.6.3. Specialized VPN Internet Protocols
  - 3.6.4. Principal Components of a VPN Based on the Internet

### **Unit 4. Mobile Telephone and Wireless Communication**

**[6 Hrs.]**

- 4.1. Basic cellular system
- 4.2. Mobile radio environment
  - 4.2.1. Trunking
  - 4.2.2. Efficiency
  - 4.2.3. Performance criteria
- 4.3. Operation of cellular systems
- 4.4. GSM/ LTE/UMTS evolution and architecture
- 4.5. CDMA architecture
- 4.6. WiFi, WiMax, & HOTSPOT Technology
- 4.7. 4G, 5G, & 6G Technology

### **Unit 5. Access network & Transmission Network**

**[10 Hrs.]**

- 5.1. Types of faults, Maintenance of network- Types of maintenance, MCC; FTTH Network- OLT, Level splitter, CPE, Fusion splicing techniques
- 5.2. Basic transmission network (Backbone, Spur link)
- 5.3. IP concept for transmission network
- 5.4. Introduction of IDU/ ODU of PDH/SPDH equipment
- 5.5. Recurrent faults in transmission systems- their causes and remedies
- 5.6. Lightening protection mechanism for transmission equipment
- 5.7. Earthing and shielding techniques for telecom equipment

### **Unit 6. Measuring Instruments & Tools**

**[6 Hrs.]**

- 6.1. Various types of mechanical tools
- 6.2. Pliers& wrenches

- 6.3. Cable cutter
- 6.4. Winch machine
- 6.5. Multi-meter, Voltmeter, Ammeter, Wattmeter, VSWR meter, Tong tester, Sequence tester, Frequency meter

**Practical:**

**[45 Hrs.]**

1. PABX installation, communication, and complete solutions
2. Handle Measuring Instruments and Tools
3. Field Visit and Case Study:
  - a) Prepare report after visit the Telephone Company.
  - b) Prepare report after visit the Internet Service Provider

| <b>Final written exam evaluation scheme</b> |                                             |              |                            |
|---------------------------------------------|---------------------------------------------|--------------|----------------------------|
| <b>Unit</b>                                 | <b>Title</b>                                | <b>Hours</b> | <b>Marks Distribution*</b> |
| 1                                           | Introduction                                | 6            | 11                         |
| 2                                           | Telephone Switching System                  | 8            | 14                         |
| 3                                           | Data Networks and Operation                 | 9            | 15                         |
| 4                                           | Mobile Telephone and Wireless Communication | 6            | 11                         |
| 5                                           | Access network & Transmission Network       | 10           | 18                         |
| 6                                           | Measuring Instruments & Tools               | 6            | 11                         |
|                                             | <b>Total</b>                                | <b>45</b>    | <b>80</b>                  |

\* There may be minor deviation in marks distribution.

**References:**

1. Roger L. Freeman, Telecommunication System Engineering Fourth Edition, Published by John Wiley & Sons, Inc., Hoboken, New Jersey, 2004
2. J.C. Bellamy, Digital Telephony, 3rd Edition, John Wiley & Sons, New York, 2002
3. Stallings, W., Data Communication and Computer Networks, Seventh Edition, New Delhi: Prentice-Hall of India Limited, 2004

**Network and System Administration**  
(Elective II)  
EG3202IT.4

**Year: III**  
**Part: II**

**Total: 7 hours /week**  
**Lecture: 3 hours/week**  
**Tutorial: 1 hour/week**  
**Practical: ... hours/week**  
**Lab: 3 hours/week**

**Course description:**

This course is designed to introduce the concept of network, server/client, protocols and its administration. It includes resource sharing, services management and infrastructure needed for a network.

**Course objectives:**

After completion of this course students will be able to:

1. Setup and administer the small home/office network.
2. Manage basic server services.
3. Administer network remotely.

**Course Contents:**

**Theory**

**Unit 1. Computer Networking Basics** **[4 Hrs.]**

- 1.1. Networking Fundamentals
- 1.2. OSI Reference Model
- 1.3. TCP/IP Model
- 1.4. Network protocols
- 1.5. Network Architecture

**Unit 2. Server Administration** **[8 Hrs.]**

- 2.1. Installing Server and Client (Linux)
- 2.2. Linux Operating System basic commands
- 2.3. Managing Users and Groups
- 2.4. File Systems
- 2.5. Process management
- 2.6. Administering Database Server

**Unit 3. Services Management** **[7 Hrs.]**

- 3.1. Managing Services
- 3.2. Mail Servers
- 3.3. File Servers
- 3.4. Web Servers

**Unit 4. Shells** **[4 Hrs.]**

- 4.1. Introduction
- 4.2. Working with files and directories
- 4.3. Shell Variables and Scripts
- 4.4. Shell Configuration

**Unit 5. Shared Resources** **[6 Hrs.]**

- 5.1. Introduction

- 5.2. Network File Systems
- 5.3. Print Services
- 5.4. Samba
- 5.5. Resource sharing using Cloud Computing

**Unit 6. Network Support** **[6 Hrs.]**

- 6.1. Proxy Servers: Squid
- 6.2. Domain Naming System
- 6.3. Dynamic Host Configuration Protocol
- 6.4. IPv4 and IPv6 Addressing
- 6.5. Autoconfiguration
  - 6.5.1. Stateful auto-configuration
  - 6.5.2. Stateless auto-configuration
- 6.6. Firewalls
- 6.7. Administering TCP/IP Networks

**Unit 7. Network Infrastructure** **[4 Hrs.]**

- 7.1. Concept of Switch
- 7.2. Static Routing and Dynamic Routing
- 7.3. VLAN configuration
- 7.4. Spanning Tree

**Unit 8. Remote Administration** **[6 Hrs.]**

- 8.1. Webmin/usermin
- 8.2. Telnet
- 8.3. SSH
- 8.4. scp, rsync commands

**Practical:** **[45 Hrs.]**

1. Install Server/Client over VMware Environment.
2. Perform the system administration activities: User/Group management, File System management.
3. Demonstrate static and dynamic routing using Packet Tracer.
4. Demonstrate DHCP and DNS configuration.
5. Demonstrate Web and Proxy Server Configuration.
6. Working on Webmin/SSH and Telnet

| Final written exam evaluation scheme |                            |           |                     |
|--------------------------------------|----------------------------|-----------|---------------------|
| Unit                                 | Title                      | Hours     | Marks Distribution* |
| 1                                    | Computer Networking Basics | 4         | 7                   |
| 2                                    | Server Administration      | 8         | 14                  |
| 3                                    | Services Management        | 7         | 12                  |
| 4                                    | Shared Resources           | 6         | 11                  |
| 5                                    | Network Support            | 6         | 11                  |
| 6                                    | Shells                     | 4         | 7                   |
| 7                                    | Network Infrastructure     | 4         | 7                   |
| 8                                    | Remote Administration      | 6         | 11                  |
|                                      | <b>Total</b>               | <b>45</b> | <b>80</b>           |

\* There may be minor deviation in marks distribution.

**References:**

1. Larisa and Aleina (2015). Ubuntu 15.04 Server with system: Administration and Reference
2. Jonathan Hobson (2013). CentOS 6 Linux Server Cookbook. Packt Publishing
3. Stanek, William R. (2012). Windows Server 2012 Inside Out, Delhi, Phi Learning Private Limited.
4. Mitch Tulloch, (2012). Introducing Windows Server 2012. Microsoft Press
5. Orin Thomas (2013). Configuring Advanced Windows Server 2012 Services. O'Reilly Media

**Major Project**  
EG3203IT

**Year: III**  
**Part: II**

**Total: 8 hours /week**  
**Lecture: ... hours/week**  
**Tutorial: ... hour/week**  
**Practical: 8 hours/week**  
**Lab: ... hours/week**

**Course description:**

The main aim of this course is to plan and complete project work, related with Information Technology under the supervision of an instructor or a supervisor.

**Course objectives:**

On completion of this course, the students will be able to:

1. Develop the ability to tackle individually a selected problem to a reasonable depth of understanding
2. Develop the ability to organize and produce a professional product using an engineering approach
3. Develop the ability to produce technical documentation to a high standard
4. Develop the ability to produce an analytical report which explains the work carried out by the students in the project and the final product they have developed

**Project Overview:**

1. Group formation (3-4 persons / group)
2. Project concept development
  - a. Finding Project concept
  - b. Scope of project
  - c. Completion time
3. Proposal preparation and presentation-2 weeks
4. Mid-term defense (should complete literature review, methodology, project design and project progress report)-8 weeks after the proposal acceptance
5. Final defense (should deliver complete project and report)-4 weeks after mid-term defense
6. Project documentation (must follow project documentation guide line given by supervisor or the department)
7. Submission of hard cover project document to department-1 week after final defense

**Description of the Project Work:**

The work carried out must be a practical, problem-solving project. It should be a realistic project in the sense that the product should be useful practically as far as possible.

**The project should:**

- be intended to develop an IT solution to a practical problem
- be carried out using an engineering approach
- emphasize design
- be carried out in a group (3-4 person/group)
- normally result in the production of a piece of software
- include technical documentation based on documentation guideline.
- be fully described from inception to completion in a written report produced to a good level of professional competence

**Procedure:**

1. A detailed project proposal to be submitted to the project supervisor for the approval of project work.
2. A mid-term progress report to be submitted to the supervisor. The supervisor must hold an oral presentation of about 10 minutes (including progress preview) to evaluate the mid-term progress of the project work.
3. A final written report will be submitted at the end of project work. There will be a final oral group presentation of about 15 minutes (including demonstration). The project coordinator, the supervisor and the external examiner nominated by the project coordinator will evaluate the submitted report as well as the presentation.

**Requirements for report writing:**

Font Name: Times New Roman

Top Margin: 1 inch

Left Margin: 1 inch

Right Margin: 1 inch

Bottom Margin: 1 inch

Gutter: 0.25 inch (left)

Header and Footer: 0.5 inch

Line Spacing: Single

Paragraph Spacing: 8 pt.

Font Size: 12 pt. (for normal text)

Follow following standard for headings

**2. Heading1 (16pt, Bold)****2.1. Heading2 (14pt, Bold)****2.1.1. Heading3 (13pt, Bold)****2.1.1.1. Heading4 (12pt, Bold)****Arrangement of Contents in a report:**

The sequence of contents in a major project report is as follows

1. Cover Page
2. Title Page
3. Certificate of Approval
4. Acknowledgment
5. Executive Summary
  - Executive Summary should be one-page synopsis of the project report and it must clearly give the overview of the project.
6. Table of Contents
  - The table of contents should list all material following it as well as any material which precedes it.
7. List of Figures (if any)
  - The list should use exactly the same captions as they appear below the figures in the text.
8. List of Tables (if any)
  - The list should use exactly the same captions as they appear above the tables in the text.
9. List of Symbols (if any)
  - The list should provide the detail of the symbols used in the report.
10. Abbreviations (if any)

- Abbreviation list should provide the details of the abbreviations used in the report in alphabetical order.
- 11. Main body
  - 11.1. Chapter 1: Project Overview (Introduction, Objectives and Scope, Project Features, Feasibility, System Requirement)
  - 11.2. Chapter 2: Literature Review
  - 11.3. Chapter 3: Design and Methodology (e.g., System Design, methods used, tools, data source)
  - 11.4. Chapter 4: Result and Analysis
  - 11.5. Chapter 5: Conclusion, Recommendation and Limitations
- 12. References
  - The reference material should include the author's name, title, year. Do not mention the references of the websites in the report.
- 12. Appendices (if any)
  - Appendices are provided to give supplementary information, which is included in the main text may serve as a distraction and cloud the central theme. Appendices should be numbered using Arabic numerals, e.g., Appendix 1, Appendix 2, etc. Tables and References appearing in appendices should be numbered and referred to appropriate places just as in the case of chapters.

**Page numbering:** The preliminary parts (Acknowledgement, Executive Summary, Table of Contents, List of symbols, List of figures, List of tables) are numbered in roman numerals (i, ii, etc.). The first page of the first chapter (Introduction) onwards will be numbered in Arabic numerals 1 2 3 etc. at the bottom.

**Figure and Table numbering:** It is useful and convenient to number the figures also chapter-wise. The figures in chapter 4 will be numbered as Figure 4.1: Figure Name. This helps you in assembling the figures and putting it in proper order. Similarly, the tables are also numbered as Table 4.1: Table Name. All figures and tables should have proper captions. Usually, the figure captions are written below the figure and table captions on top of the table.

#### **Evaluation Scheme:**

The project coordinator, the supervisor and the external examiner should evaluate the project work and presentation by the following criteria:

| S.N. | Topic                                 | Marks Distribution                                                          |
|------|---------------------------------------|-----------------------------------------------------------------------------|
| 1    | Proposal Defense                      | 20                                                                          |
| 2    | Mid-term progress report/presentation | 60                                                                          |
| 3    | Final project report/presentation     | 120<br>(Project coordinator =10<br>supervisor =30<br>external examiner =80) |
|      | <b>Total</b>                          | <b>200</b>                                                                  |

#### **Detailed Evaluation Scheme**

| S.N. | Topic                                     | Marks Distribution |
|------|-------------------------------------------|--------------------|
| 1    | Presentation skill                        | 20%                |
| 2    | Team work                                 | 10%                |
| 3    | Understanding of project work and related | 20%                |

|   |                       |             |
|---|-----------------------|-------------|
|   | theory                |             |
| 4 | Project demonstration | 20%         |
| 5 | Project Applications  | 10%         |
| 6 | Documentation         | 20%         |
|   | <b>Total</b>          | <b>100%</b> |

### **Experts involved in Curriculum Revision, 2022**

1. Prof. Dr. Subarna Shakya, Professor, Pulchowk Campus, IOE, TU
2. Dr. Surendra Shrestha, Reader, Pulchowk Campus
3. Er. Prabin Shrestha, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
4. Er. Suraj Kumar Hekka, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
5. Er. Anup Bhujju, Instructor, Nepal Banepa Polytechnic Institute, CTEVT
6. Er. Milan Chikanbanjar, Senior Lecturer, Khowpa Engineering College
7. Er. Sangam Gautam, Technical Officer, CTEVT sanothimi
8. Anand Kumar Shah, Associate Professor, Pulchowk Campus, IOE, TU
9. Anil Verma, Lecturer, Pulchowk Campus, IOE, TU
10. Sandesh Thapa, Trainer, TITI, Sanothimi
11. Akash GC, IT Instructor, KIT, Tokha
12. Kumar Prasun, Lecturer, Padmakanya, Multiple Campus, TU
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