Eight Semester:

Course Title: **Image Processing**
Course Code: COM**48**1
Semester: VIII
Credit: **3**
Class Load: **6** Hrs. per Week (Theory: 3 Hrs, **Practical: 3 Hrs**)
Evaluation: External (60) + Internal(20+20)

Course Objectives:

To provide working knowledge of theories and applications of thermal science

1. To make able to apply laws of thermodynamics in various systems.
1. To make able to distinguish the cycles in various engines, and pumps.
2. To make able to calculate energy/quantity of heat transfer by conduction and radiation.

Course Contents:

1. Introduction to Digital Image Processing (4 hrs)
Digital image representation, Digital image processing: Problems and application, Elements of visual perception, Sampling and Quantization, Relationships between pixels.

1. Tow-dimensional Systems (5 hrs)
Fourier transform and Fast Fourier Transform, Other image transforms, Other image transforms and their properties: Cosine transform, Hadamard transform, Haar transform.

2. Image Enhancement and Restoration (8 hrs)
Point operations, Contrast stretching, Clipping and thresholding, Digital negative, intensity level slicing, Bit extraction, Histogram modeling, Equalization modification, Specification, Spatial operations, Averaging, Directional smoothing, Median, Filtering spatial low pass, High pass and band pass filtering, Magnification by replication and interpolation.

3. Image Coding and Compression (4 hrs)
Pixel coding: run length, bit plan, Predictive and inter-frame coding.

4. Introduction to Pattern Recognition and Images (3 hrs)

5. Recognition and Classification (5 hrs)

Recognition classification, Feature extraction, Models, Division of sample space.

7. Grey Level Features Edges and Lines (6 hrs)

Similarity and correlation, Template matching, Edge detection using templates, Edge detection using gradient models, Model fitting, Line detection, Problems with feature detectors.

8. Segmentation (3 hrs)

Segmentation by thresholding, Regions for edges, line and curve detection.

9. Frequency Approach and Transform Domain (3 hrs)

10. Advanced Topics (4 hrs)

Neural network and their application to pattern recognition, Hopfield nets, hamming nets, perception

Laboratory Works:

Laboratory exercises using image processing and pattern recognition packages.

Text Book:

- K. Castlemann, *Digital Image Processing*, Prentice Hall of India Pvt. Ltd., 2010.
- A.K. Jain, *Fundamental of Digital Image Processing*, Prentice Hall of India Pvt. Ltd., 2011.

Reference:

- Sing_tze Bow, M. Dekker, *Pattern Recognition and Image Processing*, 2008.
- R.C. Gonzalez and P. Wintz, *Digital Image Processing*, Addision-Wesley Publishing, 2009.
- M. James, *Pattern Recognition*, BSP Professional books, 2008.

Course Title: **Cloud Computing**
Course Code:**COM48**2
Semester: VIII
Credit: **3**
Class Load: **6** Hrs. per Week (Theory: 3 Hrs, **Practical: 3 Hrs**)
Evaluation: External(60) + Internal(20+20)

Course Objectives:
The objective of this course is to provide cloud computing, cloud security, Cloud computing platforms and Cloud for the enterprise as service.

Course Contents:

1. **Introduction to Cloud Computing (5 hrs)**
   1.1Definition, Characteristics,
   1.2 Components,
   1.3 Cloud provider,
   1.4 Organizational scenarios of clouds,
   1.5 Administering & Monitoring cloud services, Benefits and limitations,
   1.6 Deploy application over cloud,
   1.7 Comparison among SAAS, PAAS, IAAS
   1.8 Cloud computing platforms
   1.9 Infrastructure as service

1. **Introduction to Cloud Technologies (5 hrs)**
   1.1 Study of Hypervisors
   1.1 Compare SOAP and REST
   1.2 **Webservices, AJAX and mashups**-Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces, Mashups: user interface services
   1.3 **Virtualization Technology**: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization
   1.4 **Multitenant software:** Multi-entity support, Multi-schema approach, Multi-tenance using cloud data stores, Data access control for enterprise applications,

2. **Data in the Cloud (5 hrs)**
   1.1 Relational databases
   1.1 Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Introduction to cloud development, Map-Reduce model

3. **Cloud Security Fundamentals (7 hrs)**
   1.1 Vulnerability assessment tool for cloud
   1.1 Privacy and Security in cloud

5. Cloud computing security architecture:

Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control-Identity management, Access control, Autonomic Security (**6 hrs)**

6.Cloud computing security challenges(12 hrs)

Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud, Issues in cloud computing, Implementing real time application over cloud platform , QOS Issues in Cloud, Dependability, Data migration, streaming in Cloud, Quality of Service (QoS) monitoring in a Cloud computing environment, Cloud Middleware, Mobile Cloud Computing, Inter Cloud issues, A grid of clouds, Sky computing, load balancing, Resource optimization, Resource dynamic reconfiguration, Monitoring in Cloud
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7.Cloud computing platforms (3 hrs)

Installing cloud platforms and performance evaluation, Features and functions of cloud platforms, Xen Cloud Platform, Eucalyptus, OpenNebula, Nimbus, TPlatform,Apache Virtual Computing Lab (VCL)

8. Cloud for the enterprise as service (2 hrs)

Storage, Database, Information, Process, Platform, Integration, Security. Management/

Governance, Infrastructure.

Laboratory Works:

The practical classes should include**all the topics mentioned above.**

Text Book:

- Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper "*Cloud Computing for Dummies*", Wiley India Edition.

Reference:

- Gautam Shroff,"*Enterprise Cloud Computing",*Cambridge.
- Ronald Krutz and Russell Dean Vines, "Cloud Security ", Wiley-India.
- David S. Linthicum, *"Cloud Computing and SOA Convergence in your Enterprise"*, Pearson.

Course Title: **Internship**
Course Code:**COM483**
Semester: VIII
Credit: **6**
Class Load: **6** Hrs. per Week (**Practical: 6 Hrs**)
Evaluation:Supervisor (60) + Mentor (60) + Internal (30) + External (50) = 200

Course Objectives:

The students are required to complete a six credit (minimum ten weeks long) internship as a part of the courserequirement. Industry is a crucial requirement of the Internship course and this will have to be secured before getting started with the course. The work that the students perform during the Internship will have to be supervised by the faculty members as well as by representatives from the participating Industries. The internship experience is expected to enable the students to assist in the resolution of complex problem associated with some aspect of computer networking.

At the end of the Internship, the student(s) are required to write a report on their internship work. Such a report needs to be structured according to the prescribed format. The Report forms a major aspect of the evaluation of the Internship work.

Goal: To assist students in focusing their interests, thus aiding in the selection of future coursework and the assessment of ultimate career pursuits. It gives students the opportunity to re-examine their career objectives and explore the variety of opportunities in the field of computer networking.

Preparation
Students, the advisors, and the industry/organization, with which the student team is affiliated, will have to agree on a problem that needs to be addressed during the internship. An internship is designed by the advisor and the student according to mutual interests, needs and availability of related industry/organization. To develop a rewarding program, at the beginning of the internship, the advisor and student are asked to establish an internship plan, in the form of written objectives and goals, and to develop a strategy for attaining those goals. The plan may include a schedule of activities that need to be carried out in order to reach a solution for the problem being addressed. The internship plan is not intended to be rigid. Advisor may be unable to assess certain responsibilities until the student demonstrates his or her ability. The plan should be flexible and subject to revision. The advisor and student should assess the student's progress throughout the term of the internship both to evaluate the student's performance, and to establish new directions as needed.

Role of the Advisor

1. Advisors are expected to share their experience, insight, and enthusiasm with the student throughout the internship.

1. Advisors should continually monitor the progress of the student, assessing written and oral communications and guiding the development of the student's technical and managerial skills, effectiveness and presentation of self.

2. Advisors are expected to submit a post-internship evaluation of the student's accomplishments and abilities and of the internship program in general.

Role of the Student

In order for the internship to be a mutually beneficial experience, a student should begin with a definition of his/her objectives and specific interests for the 10-week period to ensure that appropriate activities and projects are selected by the advisor and the student. The student will be responsible for the timely completion and professional quality of all activities and projects assigned. The student is expected to speak frequently with the advisor on his/her progress and interest in other projects, as well as to discuss observations and questions about meetings, projects and other activities with which he/she is involved.

The student is required to submit to Advisor, within the first two weeks of the internship, a brief plan for the internship.

Elective (Any One)
Course Title: **Geographical Information System**
Course Code: COM**484A**

Course Title:**Mobile Application Development**
Course Title: **COM484B**

Course Title: **E-Governance**
Course Code: **COM484C**

Course Title:**Bioinformatics**
Course Title: **COM484D**

Semester: **VIII**
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Practical: **3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Title: Geographical Information System (GIS)

Course Title: **COM484A**

Semester: **VIII**
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Practical: **3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Objectives:
The course covers about spatial data modelling and database design, capturing the real world, spatial analysis and visualization, overview of open GIS

Course Contents:

1. Introduction (6hrs)
Overview, History and concepts of GIS, Scope and application areas of GIS, Purpose and benefits of GIS, Functional components of GIS , Importance of GPS and remote sensing data in GIS

2. Digital Mapping Concept (3 hrs)
Map concept: Map elements, Map layers, Map scales and representation, Map projection: Coordinate system and projection system

3. Spatial Data Modeling and Database Design (9 hrs)

Introduction to geographic phenomena and data modeling ,Spatial relationships and topology, Scale and resolution, Vector, Raster and digital terrain model, Spatial database design with the concepts of geodatabase.

4. Capturing the Real World (8hrs)
Different methods of data capture, Map projection and spatial reference, Data preparation, conversion and integration, Quality aspects of spatial data, GPS, Remote Sensing

5. Spatial Analysis and Visualization (7hrs)
Spatial analysis
i. Overlay
ii. Buffering
Map outputs and its basic elements

6.Introduction to Spatial Data Infrastructure (8hrs)
SDI concepts and its current trend, The concept of metadata and clearing house, Critical factors around SDIs

7. Open GIS (4hrs)
Introduction of open concept in GIS, Open source software for spatial data analysis, Web Based GIS system, System Analysis and Design with GIS

Laboratory Works:
The lab should cover at least the concepts given the chapters.

Text Book:

- Rolf De , Richard A. knippers, Yuxian sun

"*Principles of geographic information systems*: An introductory textbook, international institute for Geo-information science and Earth observation, the Netherlands"

Reference:

- Andy Mitchell "*ESRI guide to GIS analysis*", ESRI press.

Course Title: **Mobile Application Development**
Course Title: **COM484B**

Semester: **VIII**
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Practical: **3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Objectives:

The objective of the course are

1. To understand system requirements for mobile applications
2. To generate suitable design using specific mobile development frameworks
3. To generate mobile application design
4. To implement the design using specific mobile development frameworks
5. To deploy the mobile applications in marketplace for distribution

Course Contents:

1. Mobile Applications(8 hrs)

Mobile Web Presence: Mobile Content, Mobile Browser, Mobile Applications: When to Create App, Benefits of Mobile App, App as Web App, Web Services: Definition, Examples, and Advantages of Web Services, Web Service Language Formats: XML, JSON, Transferring Non-textual Data, Creating Example Web Service: Using MS Stack, Using LAMP Stack, Debugging Web Services: Tools, Advanced Web Service Techniques

2. Mobile UI Design and Mobile Web Sites (10 hrs)

Effective Use of Screen Real Estate, Understanding Mobile Application Users, Understanding mobile Information Design, and Mobile Platforms, Using Tools of Mobile Interface Design, Choosing Mobile Web Option, Adaptive Mobile Websites, Dedicated Mobile Websites, Mobile Web Apps with HTML5

3. Working with Android (10 hrs)

Why Android?, Supporters of Android, Competition with itself, Tools: JDK, Eclipse, SDK, Eclipse ADT Plug-in, Additional SDK Components, Development, Connecting to the Google Play, Android Development Practices, Building App in Android

4. Working with IOS (12 hrs)

Apple iPhone, Tools (Hardware, xCode, iOS SDK iOSGuideline), Anatomy of iOS App, xCode IDE, iOS Simulator, Debugging Code, Instruments, Objective C Basics: Classes, Control Structures, Try-Catch, Hello World App, Building App iOSOther useful iOS things

5. Working with BlackBerry (5 hrs)

BlackBerry Devices and Playbook, Tools: BlackBerry Developer Program, Code signing Keys BlackBerry Java Development Environment, Developing App with BlackBerry, Eclipse Specifics for BlackBerry, Development with WebWorks, Other useful BlackBerry things, Blackberry Distribution

Laboratory Works:

Student should write programs and prepare lab sheet for all of the units in the syllabus. Students should be able to Mobile Apps by using various concepts and Platforms discussed in class. The lab work should be practiced for minimum of 3 lab hours per week

Text Book:

- Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

Reference:

- Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
- James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
- David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6
- Development: Exploring the iOS SDK”, Apress, 2013.

Course Title: **E-Governance**
Course Code: **COM484C**
Semester: **VIII**
Credit: **3**
Class Load: 6 Hrs. per Week (Theory: 3 Hrs, Practical: **3 Hrs**)
Evaluation: External (60) +Internal (20+20)

Course Objectives:
To provide the knowledge of good governance using information and communication technologies and case studies of different countries.

Course Contents:

1. **Introduction**(4 hrs)

E-Governance: Needs of E-Governance, Issues in E-Governance applications and the Digital Divide; Evolution of E-Governance, Its scope and content; Present global trends of growth in E-Governance: Other issues.

2. **Models of E-Governance** (10 hrs)

Introduction; Model of Digital Governance: Broadcasting/ Wilder Dissemination Model, Critical Flow Model, Comparative Analysis Model, Mobilization and Lobbying Model, Interactive-service Model/Government-to-Citizen-to-Government Model (G2C2G); Evolution in E-Governance and Maturity Models: Five Maturity Levels, Characteristics of Maturity Levels, Key areas, Towards Good Governance through E-Governance Models.

3. **E-Governance Infrastructure and Strategies**(6 hrs)

E-readiness: Digital System Infrastructure, Legal Infrastructural Preparedness, Institutional Infrastructural Preparedness, Human Infrastructural Preparedness, Technological Infrastructural Preparedness; Evolutionary Stages in E-Governance.

4. **Data Warehousing and Data Mining in Government**(5 hrs)

Introduction; National Data Warehouses: Census Data, Prices of Essential Commodities; Other areas for Data Warehousing and Data Mining: Agriculture, Rural Development, Health, Planning, Education, Commerce and Trade, Other Sectors.

5. **Case Studies**(20 hrs)

Nepalese Context: Cyber Laws, Implementation in the Land Reform, Human Resource Management Software; India: NICNET, Collectorate, Computer-aided Administration of Registration Department

(CARD), Smart Nagarpalika, National Reservoir Level and Capacity Monitoring System, Computerization in Andra Pradesh, EkalSevaKentra, SachivalayaVahini, Bhoomi, IT in Judiciary, E-Khazana, DGFT, PRAJA, E-Seva, E-Panchyat, General Information Services of National Informatics Centre; E-Governance initiative in USA; E-Governance in China; E-Governance in Brazil and Sri Lanka.

Text Book:

- E-Governance: Concepts and Case Studies, C.S.R. Prabhu, Prentice-Hall of India Private Limited, 2004.

Reference:

- Backus, Michiel, e-Governance in Developing Countries, IICD Research Brief, No. 1, March 2001.