1. Study of optical fibers
2. Multimode behavior of a optical fiber
3. Measurement of Bend Loss
4. Study of an optical attenuator
5. L-I curve of a Laser
6. Construction of a power meter
7. Fiber optic Data Communication
8. BER plot of fiber optic system
9. Project on fiber optic system

CSE 4201: Digital Image Processing

100 Marks [50% Exam, 10% In-course/Quizzes/Class Tests, 5% Class Attendance, 10% Assignment and Presentation/Class Performance, 25% Mid-term]

3 Credits,*45*Contact hours, Exam. Time: 3 hours

Introduction and Fundamental to Digital Image Processing: What is Digital Image Processing, Origin of Digital Image Processing, Examples that use Digital Image Processing, Fundamenal steps in Digital Image Processing, Components of Digital Image Processing System, Image sensing and acquisition, Image sampling, quantization and representation, Basic relationship between pixels.

Image Enhancement in the Spatial Domain & Frequency domain: Background, Basic gray level transformation, Histogram processing, Basics of spatial filtering, Smoothing and Sharpening Spatial filters, Introduction to Fourier Transform and the Frequency Domain, Discrete Fourier Transform. Smoothing and Sharpening Frequency-Domain filters.

Image Restoration: Image Degradation/Restoration Process, Noise models, Restoration in presence of noise, Inverse Filtering, Minimum Mean Square Filtering, Geometric mean filter, Geometric transformations.

Color Image Processing: Color Fundamentals, Color models, Basis of full color image processing, Color transformations.

Image Compression: Fundamentals, Image compression models, Error free compression, Lossy compression.

Morphological image processing: Preliminaries, Dilations and Erosion, opening and closing, Some basic morphological algorithms.

Image Segmentation: Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.

Representation, Description and Recognition: Representation-chain codes, polygonal approximation and skeletons, Boundary descriptors-simple descriptors, shape numbers, Regional descriptors- simple, topological descriptors, Pattern and Pattern classes-Recognition based on matching techniques.

Books Recommended:

1.	Rafeal C. Gonzalez & Richard E. Woods	:	**Digital Image Processing,** *Prentice-Hall Publication*
2.	A. K. Jain	:	**Fundamentals of Digital Image Processing,***Academic Press.*
3.	Mark S. Nixon & Albert S. Aguado	:	**Feature Extraction and Image Processing**, *Academic Press*
4	William K. Pratt	:	**Digital Image Processing**. *Wiley-Interscience,*

CSE4202: Digital Image Processing Lab

100 Marks [50% Practical, 45% Quizzes/Viva-voce/Lab Performance, 05% Attendance]

1.5 Credit, 45 Contact hours

Laboratory works based on **CSE4201**

CSE 4203: Web Engineering

100 Marks [50% Exam, 10% In-course/Quizzes/Class Tests, 5% Class Attendance, 10% Assignment and Presentation/Class Performance, 25% Mid-term]

3 Credits,*45*Contact hours, Exam. Time: 3 hours

An Introduction to Web Engineering: Categories of Web Applications, Characteristics of Web Applications, Product-related Characteristics, Usage-related Characteristics, Development-related Characteristics: **Requirements Engineering for Web Applications:** Where Do Requirements Come From? Requirements Engineering Activities RE Specifics in Web Engineering, Principles for RE of Web Applications, Adapting RE Methods to Web Application Development, Requirement Types, Notations, Tools; **Web Application Architectures:** What is an Architecture? Developing Architectures, Categorizing Architectures ,Specifics of

Web Application Architectures, Components of a Generic Web Application Architecture, Layered Architectures 2-Layer Architectures , N-Layer Architectures , Data-aspect Architectures , Database-centric Architectures ,Architectures for Web Document Management Architectures for Multimedia Data; **Modeling Web Applications:** Modeling Specifics in Web Engineering, Levels 3.3.2 Aspects, Phases, Customization, Modeling Requirements ,Content Modeling (Objectives , Concepts) Hypertext Modeling (Objectives , Hypertext Structure Modeling Concepts, Access Modeling Concepts, Relation to Content Modeling) Presentation Modeling(Objectives, Concepts, Relation to Hypertext Modeling), Customization Modeling (Objectives, Concepts, Relation to Content, Hypertext, and Presentation Modeling) Methods and Tools (Modeling Methods: An Overview ,Model-Driven Development, Tool Support) **Technologies for Web Applications:** Markup, Hypertext and Hypermedia ,Client/Server Communication on the Web (SMTP – Simple Mail Transfer Protocol , RTSP – Real Time Streaming Protocol , HTTP – HyperText Transfer Protocol, Session Tracking) Client-side Technologies (Helpers and Plug-ins ,Java Applets ,ActiveX Controls) Document-specific Technologies (HTML – Hypertext Markup Language, SVG – Scalable Vector Graphics ,SMIL – Synchronized Multimedia Integration Language, XML – eXtensible Markup Language , XSL – eXtensibleStylesheet Language), Server-side Technologies (URI Handlers , Web Services ,Middleware Technologies) **Testing Web Applications:** Terminology(Quality Characteristics , Test Objectives , Test Levels) Role of the Tester ,Test Specifics in Web Engineering, Test Approaches(Conventional Approaches , Agile Approaches) Test Scheme (Three Test Dimensions (Applying the Scheme to Web Applications Examples of Using the Test Scheme) Test Methods and Techniques (Link Testing, Browser Testing , Usability Testing, Load, Stress, and Continuous Testing ,Testing Security, Test-driven Development) Test Automation(Benefits and Drawbacks of Automated Tests, Test Tools , Selecting Test Tools)

ASP.NET programming model, Web development in Microsoft Visual Studio .NET, Anatomy of an ASP.NET page, ASP.NET core server controls, ADO.NET data providers, ADO.NET data containers, The data-binding model, report design using crystal report.

E-Commerce: E-Commerce Definition, Internet History and E-Commerce Development, Business-to-Business E-Commerce, Business-to-Consumer E-Commerce, E-Commerce Stages and Processes, E-Commerce Challenges, E-Commerce Opportunities. Online and Offline Market Research, Data Collection, Domain Names, Advertising Options, E-Mail Marketing, Search Engines, Web Site Monitoring, Incentives. Electronic Payment Issues, E-Cash, Credit Card Issues, Merchant Accounts, Online Payment Services, Transaction Processing, Taxation Issues, Mobile Commerce (M-Commerce). Customer Service Issues, E-Mail Support , Telephone Support , Live Help Services, Customer Discussion Forums, Value-Added Options.

Books Recommended

1.	Kappel, G., Proll, B. Reich, S. and Retschitzegger, W.	:	Web Engineering, *Wiley and Sons.*
2.	Roger Pressman and David Lowe	:	Web Engineering: A Practioner's Approach
3.	Jeffrey F., Rayport, Bernard J. Jaworsk	:	E-Commerce, McGraw-Hill, ISBN-0072465212, 1st Edition.
4.	David Kosiur	:	Understanding Electronic Commerce, Microsoft Press.
5.	Jeffrey F. Rayport, et al.	:	Introduction to E-Commerce, McGraw-Hill, 1st Edition Aug- 13, 2001.
6.	Debra Cameron	:	E-Commerce Security Strategies: Protection the Enterprise. Computer Technology Research Corp. Aug-1998.
7.	Charles Trepper	:	E-Commerce Strategies
8.	SAMS Publisher	:	Web programming A desktop Reference
9.	Elias M. Awad	:	Electronic Commerce

CSE 4204: Web Engineering Lab

100 Marks |50% Practical, 45% Quizzes/Viva-voce/Lab Performance, 05% Attendance|
1.5 Credit, 45 Contact hours

Laboratory works based on **CSE 4203**

Understanding the Web application: Web Engineering introduces a structured methodology utilized in software engineering to Web development projects. The course addresses the concepts, methods, technologies, and techniques of developing Web sites that collect, organize and expose information resources. Topics covered include requirements engineering for Web applications, design methods and technologies, interface design, usability of web applications, accessibility, testing, metrics, operation and maintenance of Web applications, security, and project management.

Specific technologies covered in this course include client-side (XHTML, JavaScript, and CSS) and server-side (Perl and PHP). Using the described concepts students should be able to understand the Web engineering concepts behind the frameworks of Joomla, Drupal, Wordpress.
Server-side technology: LAMP, Web application frameworks (example: Silverlight, Adobe Flex), Web 2.0 and Web APIs. **Front-end technology:** HTML, XHTML, XML, CSS styling, layout, selector, Document object model and JavaScript. **Client-Programming:** Web APIs with JavaScript (example: Google Ajax API). **MVC:** Understanding Model, view and controller Model. **Understanding Web APIs:** REST, XML, JSON, RSS Parsing.
JavaScript Exercise: The goal of this assignment is to allow you to explore and use as many of JavaScript's objects, methods, and properties as possible in a small assignment. Some functions must be written from scratch. Other functions, appropriately attributed, may be downloaded from the web and used as a part of the system or as the basis for your own functions. **PHP Exercise:** Build a set of PHP scripts that perform some dynamic server side functionality. **Understanding plug-ins:** Develop a Firefox extension.

CSE 4210: Viva-Voce

Based on Fourth Year Courses

CSE 4208: Project (Part- II)

Each student has to complete one project in the combined duration of two semesters of Part-IV. In odd semester course CSE 4109 (Part-I), a student has to make a proposal defense at the end of the semester. The defensed project has to be completed in the continuation course CSE 4208 (Part-II) in even semester of Part-IV.

Option II Should be selected from the Following Courses.
CSE 4211-CSE 4212, CSE 4213– CSE 4214, CSE 4215- CSE 4216, CSE 4217- CSE 4218, CSE 4221- CSE 4222, CSE 4223- CSE 4224, CSE 4225- CSE4226

CSE 4211: Design of VLSI Circuits and Systems

100 Marks [50% Exam, 10% In-course/Quizzes/Class Tests, 5% Class Attendance, 10% Assignment and Presentation/Class Performance, 25% Mid-term]
3 Credits,*4*Contact hours, Exam. Time: 3 hours

VLSI design methodology: top-down design approach, technology trends.

MOS technology: Introduction to MOS technology, operation of MOS transistor as a switch and amplifier, MOS, NMOS, CMOS inverters, pass transistor and pass gates, DC and transient characteristics.

Overview of fabrication process: NMOS, CMOS, Bi-CMOS process.

NMOS and CMOS layout: Stick diagram, and design rules.

CMOS circuit characteristics: Resistance and capacitance, rise and fall time, power estimation.

Introduction to Bi-CMOS circuits: Shifter, adder, counter, multipliers. Data Path and memory structures. Buffer circuit design.

Design style: FPGA and PLAs.

Books Recommended:

1. K. Eshraghian& D. A. Pucknell : **Basic VLSI Design: System & Circuit**, *Prentice-Hall*
2. R. K. Brayton : **Logic Minimization Algorithms for VLSI Synthesis**, *Kluwer Academic Publishers Norwell, MA, USA.*
3. F. Lombardi and M. G. Sami : **Testing and Diagnosable Design of VLSI and ULSI**, *Springer.*
4. C. A. Mead and L. A. Conway : **Introduction to VLSI Systems**, *Addison-Wesley.*

CSE 4212: Design of VLSI Circuits and Systems Lab

100 Marks [50% Practical, 45% Quizzes/Viva-voce/Lab Performance, 05% Attendance]
1.5 Credit, 45 Contact hours

Laboratory works based on **CSE4211**

CSE 4213: Wireless Communication

100 Marks [50% Exam, 10% In-course/Quizzes/Class Tests, 5% Class Attendance, 10% Assignment and Presentation/Class Performance, 25% Mid-term]
3 Credits,*45*Contact hours, Exam. Time: 3 hours

CSE 4221: Machine Learning

100 Marks [50% Exam, 10% In-course/Quizzes/Class Tests, 5% Class Attendance, 10% Assignment and Presentation/Class Performance, 25% Mid-term]

3 Credits,*45*Contact hours, Exam. Time: 3 hours

Intro & Basics: The concept learning task, Goals and applications of machine learning. Aspects of developing a learning system, Version Spaces, Parameter Estimation.

Supervised Learning/Classification:

Linear Classifiers: Linear Regression, Logistic Regression, Naive Bayes, Overfitting, Bias-Variance Trade-off, Discriminitive vs. Generative Models.

Non-linear Classifiers: Decision Trees; Artificial Neural Networks: Linear threshold units, Perceptrons, Multilayer networks and backpropagation, recurrent networks; k-Nearest Neighbor.

Margin-based Approaches: Support Vector Machines (SVMs)

Computational Learning Theory: Sample Complexity, Probably Approximately Correct (PAC) learning, Vapnik-Chervonenkis (VC) Dimension

Unsupervised Learning/Clustering: Hierarchical Agglomerative Clustering, K-means, Spectral Methods, EM.

Density Estimation via Structured Models: Graphical Models, Bayesian Networks, Markov Random Field

Ensemble learning: boosting, bagging; Hidden Markov Models,Reinforcement Learning.

Books Recommended:

1. R.O. Duda, P.E. Hart, D.G. Stork : **Pattern Classification**, *Wiley & Sons, Inc., New York*
2. S. Theodoridis, K. Koutroumbas, : **Pattern Recognition**, *Academic Press*
3. C.M. Bishop : **Pattern recognition & Machine Learning**, *Springer Science+Bussiness Media, LLC, New York.*
4. T. Hastie, R. Tibshirani & J. Friedman : **The Elements of Statistical Learning: Data Mining, Inference, and Prediction**, *Springer*
5. Tom Mitchell : **Machine Learning**, *McGraw-Hill.*

CSE 4222: Machine Learning Lab

100 Marks [50% Practical, 45% Quizzes/Viva-voce/Lab Performance, 05% Attendance]

1.5 Credit, 45 Contact hours

Laboratory works based on **CSE4221**