

BANASTHALI VIDYAPITH

Certificate/ Diploma/ Advanced Diploma Courses Faculty of Mathematics and Computing



Curriculum Structure

A. One Session Courses -

1. Certificate in Computer Programming and Applications - 2020
2. Certificate Course in Statistical Techniques and Applications - 2020
3. Certificate Course in Actuarial Sciences - 2020
4. Diploma in Internet and Web Applications - 2020
5. Diploma in .NET (C#, ASP.NET) - 2020
6. Diploma in Computer Hardware and Maintenance - 2020
7. Diploma in Actuarial Sciences - 2020
8. Diploma in Medical Image Processing - 2020
9. Advanced Diploma in Medical Image Processing - 2020

B. Half Session Courses -

10. Certificate in Android Application Development - 2020
11. Certificate Course on IT Localization - 2020

C. Online Course -

12. Advanced Diploma in Networking - 2020

BANASTHALI VIDYAPITH
P.O. BANASTHALI VIDYAPITH
(Rajasthan) – 304 022

No. F. 9-6/81-U.3

**Government of India
Ministry of Education and Culture
(Department of Education)**

New Delhi, the 25th October, 1983

NOTIFICATION

In exercise of the powers conferred by Section 3 of the University Grants Commission Act, 1956 (3 of 1956) the Central Government, on the advice of the Commission, hereby declare that Banasthali Vidyapith, P. O. Banasthali Vidyapith, (Rajasthan) shall be deemed to be a University for the purpose of the aforesaid Act.

Sd/-

(M. R. Kolhatkar)

Joint Secretary of the Government of India

NOTICE

Changes in Bye-laws/Syllabi and Books may from time to time be made by amendment or remaking, and a Candidate shall, except in so far as the Vidyapith determines otherwise, comply with any change that applies to years she has not completed at the time of change.

Certificate/ Diploma/ Advanced Diploma Courses

Sl. No.	Course	Duration	Contact Hours	Minimum Eligibility
One Session Courses				
1.	Certificate in Computer Programming and Applications	One Session (T-4, P-4)	Theory-80 Practical-80	Secondary School Certificate
2.	Certificate Course in Statistical Techniques and Applications	One Session (T-4, P-4)	Theory-80 Practical-80	Senior Secondary School Certificate
3.	Certificate Course in Actuarial Science	One Session (T-5)	Theory-100	Final Year Student of B.A./ B.Sc. (Mathematics/ Statistics/ Computer Science/ Economics/ Management) OR M.A./ M.Sc. (Mathematics/ Statistics/ Computer Science/ Economics/Management)
4.	Diploma in Internet and Web Applications	One Session (T-4, P-4)	Theory-80 Practical-80	Secondary School Certificate with Knowledge of Programming Language
5.	Diploma in .NET (C#, ASP.NET)	One Session (T-4, P-4)	Theory-80 Practical-80	Secondary School Certificate with Knowledge of Programming Language
6.	Diploma in Computer Hardware and Maintenance	One Session (T-4, P-4)	Theory-80 Practical-80	Senior Secondary School Certificate with Physics/ Mathematics OR Certificate/ Diploma/ Advance Diploma/ Post Graduate with Computer Science
7.	Diploma in Actuarial Science	One Session (T-6)	Theory-120	Final Year Student of B.A./ B.Sc. (Mathematics/ Statistics/ Computer Science/ Economics/ Management) OR M.A./ M.Sc. (Mathematics/ Statistics/ Computer Science/ Economics/ Management)

8.	Diploma in Medical Image Processing	One Session (T-4, P-4)	Theory-80 Practical-80	Senior Secondary School Certificate with Physics and Mathematics/ Biology OR UG/ PG Students of Computer Applications/ Computer Science
9.	Advanced Diploma in Medical Image Processing	One Session (T-4, P-4)	Theory-80 Practical-80	Diploma in Medical Image Processing OR Students Pursuing M.Tech./ M. Pharma.
Half Session Courses				
10.	Certificate in Android Application Development	Half Session (T-4, P-4)	Theory-40 Practical-40	Secondary School Certificate with Knowledge of Java Programming
11.	Certificate Course on IT Localization	Half Session (T-2, P-6)	Theory-20 Practical-60	One Year Computer Certificate/ Diploma OR Equivalent
Online Course				
12.	Advanced Diploma in Networking	Online	200 (minimum)	Senior Secondary School Certificate (Four Modules)

Note: Minimum attendance required is 70%.

Scheme of Examination for Certificate/Diploma/Advanced Diploma Courses

	Exam. Duration	Contact		Cont. Ass.		Final Ass.		Total		Min. Pass		
		Hour/week		Marks		Marks		Marks		Marks		
		T	P	T*	P**	T	P	T	P	T	P	
One Session Course												
1. Certificate Course in Computer Programming and Applications	3 hrs	4	4	40	40	60	60	100	100	40	40	
2. Certificate Course in Statistical Techniques & Applications	2 hrs	4	4	20	20	40	40	60	60	24	24	
3. Certificate Course in Actuarial Sciences	3 hrs	6	-	30	-	60	-	90	-	36	-	
4. Diploma in Internet & Web Applications	3 hrs	4	4	40	40	60	60	100	100	40	40	
5. Diploma In .NET (C#, ASP.Net)	3 hrs	4	4	40	40	60	60	100	100	40	40	
6. Diploma in Computer Hardware and Maintenance	3 hrs	4	4	40	40	60	60	100	100	40	40	
7. Diploma in Actuarial Sciences	3 hrs	6	-	30	-	60	-	90	-	36	-	
8. Diploma in Medical Image Processing	3 hrs	4	4	40	40	60	60	100	100	40	40	
9. Advanced Diploma in Medical Image Processing	3 hrs	4	4	40	40	60	60 [#]	100	100	40	40	

Half Session Courses

11. Certificate in Android Application Development	3 hrs	4	4	40	40	60	60	100	100	40	40
11. Certificate Course on IT Localization	3 hrs	2	6	40	40	60	60	100	100	40	40

Online Course

12. Advance Diploma in Networking [@]	3 hrs	200 Minimum				100	100	100	100	40	40
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* Continuous assessment will be based on assignment(s)/test(s)/quiz(es)/presentations(s)/any other component(s) as decided by the instructor(s).

** Continuous assessment will be based on practical test(s)/viva-voce/minor project(s)/any other component(s) as decided by the instructor(s)

Includes Dissertation of 20 marks.

@ No continuous Assessment. Final Examination will be conducted only after completion of Fourth Module of CISCO Course.

Note:

1. Minimum Pass Percentage is 40% both in Theory Examination and Practical Examination separately.
2. Successful candidates should be classified as follows:

(i) 75% marks or above	Distinction	(ii) 60% marks or above	First Division
(iii) 50% marks or above	Second Distinction	(ii) 40% marks or above	Pass

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Certificate in Computer Programming and Applications

Theory – 80 hrs.

Practical – 80 hrs.

Learning Outcomes: After completion of this course, the students will be able to:

- Develop conceptual understanding of computer, its components and working.
- Apply the acquired knowledge of application software and system software in different areas.
- Apply computer programming skill to design programs for solving problem like searching sorting.
- Use computer and apply the acquired IT skills in her domain.

Section-A

Basics of Computer, block diagram and function of its components, input-output devices, primary and secondary memory, Number systems and codes, binary arithmetic (addition, subtraction), Boolean algebra, logic gates and truth tables, Demorgan's theorem. Concept of Operating System, Booting Process, Disk Operation System (DOS), DOS Commands(External & Internal), Concept of computer communication, computer network (LAN, WAN, MAN), Internet, Internet Services-www, email.

Section-B

Introduction to WINDOWS, working with MS office Package (MS-Word, Excel, Power Point), Features of MS-Word, Excel and Power point application software, Concept of database & DBMS, features of database, database operations (Creation, updation, opening, closing, sorting, indexing), querying and report generation (using MS-ACCESS).

Section-C

Programming languages, system and application software, compiler, interpreter, concept of program design & development, algorithms and flowchart development (sequencing, alteration & looping). C-Programming: Structure of a program, character set, data types, variables and constants, operators and expression, I/O operations, Flow of control statements (sequencing, alteration & looping). Arrays (one and two

dimensional), searching (linear, binary), sorting (bubble, selection), merging, function and pointer, call by value and call by reference, pointer operations

Suggested Books:

1. Sinha, P. K. (2004). Computer Fundamentals: Concept, Systems and Applications. BPB Publications.
2. Balagurusamy, E., (2010). Programming in ANSI C. Tata McGraw-Hill.

Laboratory Practices:

Fundamental Applications:

1. Problems based on DOS Internal & External Commands
2. Document Creation & Formatting in MS-Word, Mail merge,
3. Document Creation & Formatting in MS-Excel, creating various types of chart
4. Document Creation & Formatting in MS-Power Point, different layouts and transitions
5. Network Concept – Email,

‘C’ Programming:

1. Simple program based on Formula
2. Simple program based on Control structure
3. Simple problems with the help of functions
4. Array handling (insertion, deletion, searching, sorting, and merging)
5. Simple program based on Function and pointer.

DBMS using MS-ACCESS:

1. DDL commands (create table, alter table & drop table commands)
2. Apply Constraints (Primary key, foreign key, unique, not null, check)
3. Data Manipulation commands (Insert, Update, Delete, Select)
4. Various clause (Group by, Order by)
5. Arithmetic function, String Function
6. Queries on Multiple table
7. Form, Report Generation.

Certificate Course in Statistical Techniques & Applications

Theory - 80 hr
Practical - 80 hr

Objective:

To develop research methodology with statistical techniques and software packages.

Learning Outcomes: After completion of this course, the students will be able to:

- Identify nature of the variables and data
- Represent the data using appropriate tabular and graphical form.
- Apply measures to describe a data.
- Find relationship between two variables.
- Fit basic probability distributions to observed data.
- Perform testing of hypothesis to get answers to simple problems.

Section A

Concept of variable, attribute. Statistical population and sample, Sample survey versus census survey. Treatment of data-collection of primary and secondary data, Representation of data (tabular, diagrammatic and graphical methods), Measure of central tendency, dispersion, shape & peakedness of distribution.

Section B

Curve fitting through Principle of least squares: Fitting of straight line, parabola, exponential and power curves, Growth curve. Bi-variate distribution-correlation and regression. Fitting-Binomial, Poisson and normal distributions with their applications.

Odds ratio, logistic regression, Reliability and validity of attributes, Factor Analysis.

Section C

Testing of hypothesis - Meaning and need, one tail and two tail tests, large and small sample tests, tests of significance of mean, variance, proportion and correlation coefficient,

Chi-square test of independence of attributes,

ANOVA : One way and two way (one observation per cell),

Design of experiment - layout and analysis of completely randomized design (CRD) and randomized block design (RBD).

Lab Work

Excel (30 hr)

- Karl Pearson's Correlation
- Spearman Rank Correlation Coefficient
- Regression & Logistic Regression
- ANOVA-one way, two way.

SPSS (30 hr)

- CRD, RBD
- Measure of central Tendency
- Measure of Dispersion
- Factor Analysis
- Testing of Mean-Single & 2 Sample
- Testing of Variance-Single & 2 Sample
- Testing of Proportion-Single & 2 Sample
- χ^2 (Chi-Square) Test of Goodness of fit & Independence of attributes.

Note: (i) In continuous assessment of practical examination students, are required to submit primary data based project associated with their fields.

(ii) Scientific Calculator is permissible in exams.

Certificate Course in Actuarial Sciences

Theory –100 hrs.

Objectives: To acquaint the students with various statistical/financial and economical methodologies and prepare them for the Actuarial Society's examination.

Learning Outcomes: After completion of this course, the students will be able to:

- Apply mathematical tools in Algebra and Calculus to solve basic problems in actuaries.
- Understand basic terminologies in Economics and insurance sector.
- Demonstrate the results related to probability.
- Find an estimator of a parameter and examine its properties.
- Perform testing of hypothesis to validate the results obtained from a sample.

Section A

Functions: definition, limits, continuity, differentiability, integrations as inverse of differentiations, definite integrals. Matrices: basic concepts, types of matrices, basic operations, rank of a matrix, solution of system of linear equations, Cayley Hamilton theorem, eigen values and eigen vectors. Cashflow models, the time value of money, Interest rates Real and money interest rates, Discounting and accumulating, Level annuities, deferred and increasing annuities, Equations of value, Loan schedules, Project appraisal, Investments, Elementary compound interest problems

Economic theory of interaction between supply and demand, elasticity and its calculations, Utility theory, utility function, cost and revenue, national income; GDP, GNP, NNP.

Section B

Summarizing data, Introduction of Probability, addition, multiplication theorem, conditional probability and Baye's theorem. Random variables, probability mass and density functions, distribution function, joint, marginal and conditional distributions, expectation and generating functions (p.g.f.,

m.g.f., c.f.), Law of large numbers and central limit theorems. Probability distributions: Binomial, Poisson, Normal and Exponential. Concepts of sampling, random sample, sampling distribution and standard error. Sampling distribution of sample mean.

Section C

Statistical inference: point and interval estimation, Properties of a good estimator, Rao-Blackwell theorem. Introduction of MLE. Confidence intervals, testing of hypothesis problems. Most Powerful test. Bayesian Statistics, fundamental concepts of Bayesian statistics and use these concepts to calculate Bayesian estimators, Simulation methods. Decision theory, Loss distributions, calculating probabilities and moments of loss distributions both with and without limits and risk-sharing arrangements, optimum strategies under theory of games, decision function and risk functions.

Diploma in Internet and Web Applications

Theory – 80 hrs.

Practical – 80 hrs.

Learning Outcomes: After completion of this course, the students will be able to:

- Understand the concept of Internet and its services, WWW, protocol and how a web browser and web server interacts
- Design and develop a static Web Designing Tools and HTML, CSS
- Use java script to add dynamic content to website.
- Build Dynamic web site using server side PHP Programming and Database connectivity.

Section-A

Internet & WWW: Introduction to Computer Networks, Overview of OSI model, Introduction to TCP/IP and its protocols, Introduction to Internet, History & Evolution of Internet, Introduction to domain name system (DNS), Various services of Internet, Introduction to World Wide Web, Architecture of WWW, working & Features of web browser, Web Documents, Introduction to Web Designing & Web Designing Tools.

HTML: Introduction to HTML, structure of HTML document, Elements (Headings, Paragraphs, Formatting, Lists, Quotations, Links, Images, Tables, Forms, Audio, Video, Blocks, Layouts etc.) & Attributes.

Section-B

CSS: Introduction, Syntax of CSS rule, Internal, External and Embedded CSS, CSS properties (Text, Fonts, Tables, Border, Box, Lists, Background, Animation etc.), Class Selector, ID Selector, Element Selector.

JavaScript(JS): Introduction to JavaScript, JavaScript basics (statements, syntax, comments, variables, operators, data types, control structures, loops), JS objects, JS functions, JS form API, JS HTML DOM, JS Browser BOM, regular expressions, data validations using JS.

Section-C

Server-side Technologies: Historical background of server side technologies, Web Server architecture, accessing web server, working &

features of web server. Introduction to PHP, Basic Syntax, Defining variable and constant, PHP Data type, Operator and Expression, Decisions and loop, Function, String, String Related Library function, Array, Working with file and Directories, File Uploading & Downloading, Capturing HTML Form Data, State management using session and cookies. Introduction to AJAX.

Introduction to RDBMS, Database Connectivity with MySQL, Performing basic database operation (DML) (Insert, Delete, Update, Select) Setting query parameter, Executing query. Web Hosting & Publishing.

Suggested Books

1. Internet & World Wide: How to program, Paul Deitel, Harvey Deitel & Abbey Deitel, Pearson Education.
2. Fundamentals of Internet and www, Greenlaw R and Hepp E, Tata McGrawHill
3. Responsive Web Design with HTML5 and CSS3, Ben Fain, Packt Publishing Limited.
4. Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5 (Learning Php, Mysql, Javascript, Css & Html5), Robin Nixon, O'Reilly Media

Laboratory Practices:

1. Create a web page using HTML heading, formatting, Paragraph.
2. Create a web page using HTML Lists, Quotations, and Images.
3. Create a web page using HTML Lists, Quotations, and Images.
4. Create pages with HTML Audio, Video, and Blocks tags.
5. Link web pages using HTML link tag & HTML form creation.
6. Create web page layouts using HTML tables.
7. Design a static website using HTML.
8. Design a web page using Font , Tables and Link in CSS and HTML
9. Design a web page using box model in CSS.
10. Design a web page using box model in CSS.
11. Designing a web page using Table, Border, Outline, Margin in CSS and HTML using id& class selector of CSS

12. Use of data types, variables, constant, Expression, operator in Java Script
13. Use of conditional statements & looping statements in Java Script
14. Java Script functions & DOM.
15. Creation of different forms with validation using JavaScript.
16. Use of data types, variables, constant, Expression, operator in PHP.
17. Use of conditional statements & looping statements in PHP
18. Array and Function in PHP
19. Query String in PHP
20. Session handling in PHP
21. Database creation using MySql.
22. ADD record in Database using PHP
23. View record in Database using PHP
24. Delete record in Database using PHP
25. Update record in Database using PHP
26. Project Based on Web Page Designing

Diploma in .NET (C#, ASP .NET)

Theory-80 hrss

Practical-80 hrs.

Learning Outcomes: After completion of this course, the students will be able to:

- Design C# Console application with OOP features
- Illustrate validation and advanced standard tools
- Establish database connection and access it from the applications
- Construct the advanced .NET application with session, caching and AJAX tools

Section -A

Web Architecture: Basics of Asp.net, differences between Client-Side and server side Processing, client- server Architecture. Tier Architecture, Concepts of Web Hosting.

Setting Up and Installing ASP.NET: Install.Net Framework SDK, Installing Internet Information Server, Creating virtual/home directory.

Overview of the ASP.NET Framework: Asp.net and .NET Framework, Common Language Runtime, .Net Framework Class Library, Namespaces, The Structure of asp.net Page and its components.

C# Fundamentals and OOP concepts: Basic C# Programming constructs. Boxing and Unboxing, Classes and Objects, Encapsulation, Polymorphism, Inheritance, Interfaces and Collections, Properties.

Using the Standard Controls: Displaying information. Label Controls, Literal Controls, Textbox control, Radio Button and Radio Button List Controls, Check Box and Check Box List Controls, Submitting Form Data, Button controls. Link Button Control, Image Button Control, Image Control, Panel Control, Place Holder control, Hyperlink Control.

Section - B

Advanced Standard Controls: File Upload Control, Saving files with their specific size and type, Uploading Large files, Calendar Control, Displaying advertisements, Storing advertisements in XML files. Multi View Control, Wizard Control.

Validation Controls: Required Field Valuator Control, Regular Expression Valuator Control, Compare Field Valuator Control, Range Validator Control, Validation Summary Control, Custom Validator Control.

Designing Websites with master pages: Creating master pages. Creating default contents, nesting master pages, Using images and hyperlinks in master pages, registering master pages in web configuration

Using Navigation Controls: Site Map, Site Map Path Control, Menu Control and Tree View Control

Designing websites with Themes: Creating Themes, Adding skins to themes, creating named skins, Themes versus Style Sheet Themes, Registering Themes in web configuration file, Style sheets and its types.

Caching Application and Web Services: Overview of Caching, Using Page Output Caching, Creating and consuming XML Web Services.

Section - C

ADO.NET: Basic concepts of Database and its commands, Microsoft SQL Server database & SQL Server Express.

SQL Data Source Control: Creating database connections, Storing connection String in web configuration file. Executing Database Commands, Executing inline SQL Statements & Stored Procedures, Programmatically Executing Sql Data Source commands. Executing Insert, Update, Delete and select commands.

Using List Controls: Overview of the List Controls, Declaring List Items, Binding to a Data Source, Radio Button List control, List Box control, Check Box List control, Bulleted List control

Using the Grid View Control: Grid View Control fundamentals. Displaying Data, Selecting Data, Data Keys, Sorting Data, Paging through Data, Editing Data, Displaying Empty Data, Formatting the Grid View Control

Using the Details View and Form View Controls: Details View control, Fields with Details View control. Form View Control, Paging through Data with the Form View control

Using Repeater and Data List Controls: Repeater Control, Data List Controls

Using the Login Control: Overview of Login Controls, Login Controls, Authenticated Users, Custom Authentication with Login Control, Login Status Control, Login Name Control, Change Password Control, Password Recovery Control

AJAX (Asynchronous JavaScript and XML): About Ajax, Server Side Ajax, Client Side Ajax, Ajax Toolkit

Sending Emails: Designing email panel, Sending an email to multiple users, sending auto emails, Media control.

Suggested Books:

1. Galloway, J., Wilson, B., Allen, K. Scott & Matson, D. (2014). Professional ASP.NET MVC 5. John Wiley & Sons,
2. Chadwick, J., Snyder, T. & Panda, H.(2012). Programming ASP.NET MVC 4. O'Reilly Media Inc.
3. MacDonald, M.(2010). Beginning ASP.NET 4 in C# 2010. APress Media.
4. Harwani , B. M.(2009). Practical ASP.NET 3.5 Projects for Beginners. Shroff Publishers & Distributers Private Limited.
5. Watsonet, K.(2008). Biginning Visual C# 2008. Wrox Press.
6. Spaanjaars, I.(2008). Beginning ASP.NET 3.5: In C# and VB. John Wiley & Sons.
7. Bates, C.(2008). web programming building internet applications (2nd ed.). Wiley India Publications.
8. Larsen, R.(2013). Beginning HTML and CSS. John Wiley & Sons Inc.
9. Duckett, J.(2011). HTML and CSS: Design and Build Websites. John Wiley & Sons Inc.
10. Powell, T.(2010). HTML & CSS: The Complete Reference (5th ed.). McGraw Hill Professional.
11. Osmani, A.(2012). JavaScript design patterns. O'Reilly Media Inc.
12. Haverbeke, M.(2009). Eloquent JavaScript A Modern Introduction Programming(2nd ed.). Starch Press Inc.
13. Crockford, D.(2008). JavaScript: The Good Parts. O'Reilly Media Inc.

Laboratory Practices:

- 1-2 Introduction to Visual Studio .NET
- 3-4 Create, Debug & Run Console Application in C#, Control Statements, Classes & Inheritance
- 5-6 Programs based on Arrays, Enumerations & structures, Interfaces & Collection
- 7-12 Problem based on Server Controls, Advanced standard controls and themes.
- 13-15 Problem based on Validation Server Control, Master Page, State management in ASP.NET
- 16-21 Problem based on Data Management Using ADO.NET
- 22-23 Problem based on Login Controls, Navigation Controls and Web services
- 24-25 Problem based on CSS and JavaScript.
- 26-27 Problems based on AJAX toolkit.

Diploma in Computer Hardware and Maintenance

Theory – 80 hrs.

Practical – 80 hrs.

Learning Outcomes: After completion of this course, the students will be able to:

- Develop conceptual understanding of computer hardware and their operational features
- Understand the components of a computer system assemble and repair a computer system.
- Understand Windows features and installation
- Maintain their computer systems more efficiently by adopting common maintenance strategies.

Section A

Introduction: An inside look of the PC, enclosures, power supplies, mother board and related parts, sockets and slots, form factors

CPU: Introduction, identification, features of Intel CPU's (8086 to P4), cooling, chipsets.

Memory: Essential concepts, organization, packages and modules, logical/physical/virtual memory, Parity principles.

Ports: Overview, I/O devices, video/HD/FD controllers, various adaptor boards.

External connectivity, opening and closing the system, Tips for working inside a PC.

I/O: Expansion slots, system resources, types of buses, bus arbitration logic,

Electronic components: Overview, symbols and measuring instruments (analog and digital multi meter, CRO), component testing technique, fault finding, types of cables, connector and testing.

Section B

POST, CMOS setup routine and configuration, CMOS backup battery

Features and functioning of display adaptors, various kinds of display adaptor boards.

Monitors: Construction, Inside view, Repairs, Types

Storage: Magnetic storage, Hard disk drives, construction, features and characteristics, installation and replacement

Backup devices: Overview, CD-ROM, CD-R, DVD, BluRay

Data transfer: Modes, HDC, IDE, ATA, UDMA, SCSI, RAID

Devices: Keyboard and pointing devices, USB, Serial port/Parallel port, signals and operation.

Plug-and-play and hot-swap, fans and cooling, power protection and battery backup.

Printers: impact and non impact, overview of dot matrix, laser, ink-jet and line printer, repair process

SMPS construction and repairs.

Networking: Networking process, IP address and IP allotment, overview of different types of cables, hubs and switches, UPT cable and connectors, loss measurement, construction and types of optical fiber cable.

Section C

Formatting: Partitioning (low level and high level), File systems (FAT/NTFS/UFS) basics

The PC hierarchy: Hardware, BIOS, OS, Applications.

OS: A closer look and boot process, popular features, creating BOOT disk, Startup and shutdown issues, device management and properties, pre-service checkup, diagnostic utilities, disk manager

Security: Virus and Antivirus, Preventive maintenance.

Recovery: Data recovery, directory damage, CHKDSK and SCANDISK, recovering MBR, FDISK, hardware and software conflicts.

Bootable media creation

Formatting: Partitioning (low level and high level), File systems (FAT/NTFS/UFS) basics

Suggested Books:

1. James K. L. (2013), *COMPUTER HARDWARE: Installation, Interfacing, Troubleshooting and Maintenance*, PHI.
2. McMillan, T. (2016), *CompTIA A+ Complete Review Guide: Exams 220–901 and 220–902*, Sybex 3rd edition.

3. Wagh, K. S. (2016), Computer Hardware and Maintenance, Tech-Max Publication.
4. Messmer, Hans-Peter. (1994), *The Indispensable PC Hardware Book*, Addison Wesley.

Laboratory Practices:

1. Basic inside look of a PC
2. Fundamentals of analog and digital equipments like CRO, multi meter etc.
3. PCB design, Identification of electronic components, their testing and fault finding.
4. Ports, I/O Devices, VIDEO/HDD/FDD controllers and adapter boards.
5. CPU identification, features of Intel CPUs (8086 and higher), cooling, chipset.
6. Essential memory concepts (EMS/UMS/HIMEM) and organization.
7. Magnetic Memory, HDD, construction and working, concept of platters, sectors, blocks, motors and head.
8. CD and DVD memory construction and working.
9. Display, Raster v/s vector, construction and working, concept of pixel and resolution, basic repair.
10. Power supply and cables: testing, construction and repair.
11. Printers, Impact v/s non-impact, basics of dot matrix, laser, inkjet and line printer.
12. Networking: basic concepts, IP allocation, overview of Banasthali Vidyapith Networking, LAN, LAN wire connecting techniques
13. BIOS, OS, POST, CMOS (basics, routine, battery).
14. OS installation
15. Hardware v/s software conflicts, data recovery, FAT: basic concepts.
16. Diagnostic utilities: disk manager, Norton disk doctor, CHKDSK, SCANDISK, MBR, FDISK.
17. Creating a bootable media.
18. Assembling a PC

Diploma in Actuarial Sciences

Duration : **Theory –120 hrs.**
One Session **(T-6 hrs/week)**

Minimum eligibility : B.A./B.Sc. III year (Mathematics/Statistics/Computer Science/Economics/Management)*

M.A./M.Sc. (Mathematics/Statistics/Computer Science/Economics/Management)*

*Candidates who have not studied any course in Statistics during their graduate or post-graduate level, they must join certificate course in Actuarial Sciences before applying for diploma in the same.

Learning Outcomes: After completion of this course, the students will be able to:

- Understand the construction of risk models and actuarial modeling.
- Demonstrate the use of Markov jump process in modeling.
- Analyze survival data through some basic models.
- Examine mortality structure of a population.
- Analyze the data using generalized linear models.
- Understand volatility in the time series data and tools used to model it.

Section A

Reinsurance, Risk model, construct risk models involving frequency and severity distributions, moment generating function and the moments for the risk models both with and without simple reinsurance arrangements.

Principles of actuarial modeling, its applications, benefits and limitations. General principles of stochastic processes and their classification into different types. Markov chain, its essential features, Chapman Kolmogorov equations, Two state markov model.

Section B

Time homogeneous Markov jump process, time inhomogeneous Markov chain process and its simple applications: simple survival models, sickness models and marriage models. Survival models: Gompertz and Makeham

laws of mortality, estimation procedures for lifetime distributions (Kaplan Meier estimate, Nelson-Aalen estimate), Cox model for proportional hazards.

Section C

Binomial model of mortality, MLE for the probability of death, estimate transition intensities depending on age, exactly or using the census approximation, Test crude estimates for consistency with a standard table or a set of graduate estimates, and describe the process of graduation. Test for smoothness of a set of graduate estimates, Generalized Linear Models, Time series models.

Diploma in Medical Image Processing

Theory-80 hrs

Practical-80 hrs

Learning Outcomes: After completion of this course, the students will be able to:

- Illustrate the physics of MRI , CT, etc. and their reconstruction algorithms
- Create a library of code implementing re-sampling method, spatial transformation, filtering method, image registration, and image segmentation
- Choose an appropriate registration or segmentation scheme in context of a given medical scenario
- Carry out independent research work related to medical image processing

Section A

Introduction: Basics of Digital Image Processing (DIP), Computer Vision, scope of image processing in Medical Science, introduction to Matlab, ImageJ and MIPAV.

Image and Signal Processing: Sampling theory, interpolation methods including nearest-neighbour, linear, cubic & higher-order, and Fourier (using the FFT); implementation of spatial image transformations (rigid and non-rigid).

Sources of Medical Images: Briefly discussion of the physics of X-ray, CT, PET, MRI, and ultrasound; discussion of the properties of the resulting images, and of the advantages and disadvantages of each imaging modality.

Section B

Image Enhancement: Contrast adjustment, de-noising (convolution, FFT), deblurring (solving an ill-conditioned sparse linear system), edge detection (numerical approximation to a partial derivative), anisotropic diffusion (numerical solution of partial differential equations), super-resolution.

Image Registration (alignment): Discussion of intensity-based methods, including a variety of cost functions (correlation, least squares, mutual

information, robust estimators), and optimization techniques (fixed-point iteration, gradient descent, Nelder-Mead simplex method, etc.). Implementation of registration for rigid and non-rigid transformations. MRI motion compensation.

Section C

Image Segmentation (tissue classification): Discussion of simple methods such as thresholding, region growing and watershed. In-depth coverage on the method of snakes (adaptive mesh), level set method (numerical solution of partial differential equations), and clustering (classifiers).

Reconstruction Methods: Reconstruction techniques for CT (filtered back projection) and MRI (using the FFT) and its applications. Coverage of the theory of the Radon transform, the Fourier transform, and how they relate to each other.

Suggested Books :

1. Atam, P. Dhawan, H K Huang, Dae-Shik Kim (2008). Principles And Advanced Methods In Medical Imaging And Image Analysis. Singapore: World Scientific Publishing Co. Pte. Ltd.
2. John, L. Semmlow (2004). *Biosignal and Biomedical Image Processing: MATLAB-based Applications*. New York, USA: Marcel Dekker INC.
3. Yaochu, Jin and Lipo Wang (Eds.) (2009) *Fuzzy Systems in Bioinformatics and Computational Biology*. Berlin Heidelberg: Springer-Verlag.
4. James, A. Green (2002). *Medical image processing: The mathematics of medical imaging*. Greenwood Research.
5. Geoff, Dougherty (Ed.). (2011). *Medical Image Processing: Techniques and Applications*. New York, USA :Springer.
6. Isaac, N. Bankman (2009). *Handbook of Medical Image Processing and Analysis*. USA: Elsevier Inc.
7. Jiří, Jan (2006). *Medical Image Processing, Reconstruction, and Restoration: Concepts and Methods*. USA: Taylor & Francis.

Laboratory Practices:

- 1 – 2 Basic introduction to MATLAB programming environment
- 3 Introduction to image processing using MATLAB
- 4 – 5 Implementation of image enhancement techniques
- 6 Image Transformations
- 7 Image Restoration
- 8 Working with Color Images
- 9 – 11 Various applications of enhancement, restoration and transformation on medical images
- 12 – 13 Image Registration with specific applications on medical images
- 14 – 17 Image Segmentation and its applications on medical images
- 18 – 19 Image Reconstruction and its applications on medical images
- 20 – 23 Medical Image Analysis
- 24 – 25 Revision & Valedictory Sessions

Advanced Diploma in Medical Image Processing

Theory-80 hrs.

Practical-80 hrs.

Learning Outcomes: After completion of this course, the students will be able to:

- Apply clinical image management skills
- Provide consultancy to companies and business enterprises in developing tools and techniques for their specialties, where imaging is pivotal
- Enhance the imaging skill sets, expands futuristic academic and research possibilities and is more likely to create a bridge between the preclinical and clinical image science

Section A

Neuro Anatomy (Image Processing and Analysis Perspective): Relevance and importance with Advance Imaging, Tools-Brain Imaging with MRI, fMRI, DTI (Diffusion Tensor Imaging), Computational Neuro Anatomy, Measurement of brain Activity-EEG, CAT SCAN.

Cardiac Anatomy, Morphology & Coronary Imaging (Image Processing and Analysis Perspective): Basic cardiac anatomy and physiology, advance imaging modalities- Echocardiography, Cardiac Molecular Imaging, Cardiovascular CT, Cardiovascular MR, Coronary +XRay Angiography, Coronary CT Angiography, Coronary MR Angiography, Analysis of ECG

Section B

Oncology (Image Processing and Analysis Perspective): Cause and nature of diseases & trauma, inflammation and infection. Radiation therapy, Chemotherapy, Hormone Therapy, Surgery, Immunotherapy & Radionuclide therapy, Benign and malignant, Methods of spread of malignant disease, Staging, Cancer prevention and public education and +Computerised early detection processes, Patient management on treatment, side effects related to radiation and dose, Acute and Late Monitoring – Information and communication, +Cancer awareness in society.

Nuclear Imaging (Image Processing and Analysis Perspective): Imaging systems • Gamma camera - general principles • ECT (Emission Computed Tomography): Single photon emission computed tomography (SPECT) - general principles • Positron emission tomography (PET) - general principles. +Machine learning basics with python applied in Medical Image Processing.

Section C

Radiology in Forensic Medicine (Image Processing and Analysis Perspective) - Use of radiography in +damaged/mutated skeletal identification, Radiography of the +damaged skull, use of Radiography in mass disaster +(Mass killing, flood/drought, earthquake, tsunami etc).

Recent Advances in Imaging and Health Awareness: Translational imaging, Imaging used for ENT, Imaging in inflammation & infection, Image Guided Surgery (IGS), 3D/4D imaging and reconstruction. Introduction to Dermatoglyphics, Concept of CPR, Basic First Aid- Burns, Bug bites, broken bones, Hypothermia, Shock, Poison, and Breathing issues.

Suggested Books:

1. Recent advances in Radiology and Medical Imaging, Lodge & Steiner
2. Publisher-Churchill Livingstone (1979), ISBN 10: 0443018642
ISBN 13: 9780443018640
3. Decision Making in Radiation Oncology, Volume 1, Editors: Lu, Jiade J., Brady, Luther W. (Eds.), ISBN 978-3-642-13832-4, Springer Publication.
4. Introduction to Radiologic Sciences and Patient Care, 5th Edition Arlene Adler, Richard Carlton , Elsevier Publication.

Laboratory Practices:

1. Write a program in Matlab for the computation of various trigonometrical functions like sin,cos waves taking various values . Plot them.
2. Write a program for the edge detection using Sobel , Robert, Canny edge detection algorithm. Plot there histogram.

3. Develop complete software for all the basic pre-processing tasks in normal/medical images.
4. Write programs implementing various noises and its removal using Matlab.
5. Blur and de-blur any image and compute there basics statistics.
6. Develop GUI in MATLAB for Medical Calculator (BMI, BP, Thyroid, Diabetics etc) program.
7. Optimize the space any medical image using compression algorithms.
8. Develop complete GUI for image segmentation algorithms generally used.
9. Develop a GUI for the implementations of various fitness functions in Genetic Algorithm.
10. Demonstrate the concept of Fuzzy System in medical image processing.
11. Apply ANN to classify images corresponding to tumor (benign or malignant).
12. Apply hybrid approach to multi classify a tumor in any part of human body.

Certificate in Android Application Development

Theory-40 hrs.

Practical-40 hrs.

Learning Outcomes: After completion of this course, the students will be able to:

- Install and configure Android application development tools
- Design and develop User Interfaces for the Android platform
- Integrate applications with pre-existing third party libraries and manage application data
- Publish application to the Android Market

Section A

Introduction, Android versions, app development process, Android Studio, project, Java code, app build process, emulators and physical devices, log system, Model-View-Presenter pattern, views, resource files, layouts, text views, scrolling views, activities and explicit intents, activity navigation, activity lifecycle and managing states, activities and implicit intents

Section B

User input controls, buttons, text input, checkboxes, radio buttons, toggle buttons, switches, spinners, dialogs, alert dialog, date and time pickers, menus, app bar, options menu, contextual menu, contextual action bar, popup menu

Section C

Broadcast intents and broadcast receivers, notifications (creating, delivering, reusing, clearing), shared preferences, files, storing data using SQLite, sharing data with content providers, apk and publishing android app

Suggested Books:

1. Lee, Wei-Meng. (2011). Beginning Android Application Development. Indianapolis, IN: Wiley Publishing, Inc.
2. Annuzzi, Joseph Jr., Darcey, Lauren, & Conder, Shane. (2014). Introduction to Android Application Development: Android Essentials (4th ed.). Michigan, US: Addison-Wesley

3. Deitel, Paul J., & Deitel, Harvey. (2017). Android How to Program (3rd ed.). Pearson Publication
4. Meier, Reto. (2012). Professional Android 4 Application Development. Indianapolis, IN: John Wiley & Sons
5. Griffiths, David, & Griffiths, Dawn. (2017). Head First Android Development (2nd ed.) . O' Reilly Media, Inc.
6. DiMarzio, J.F. (2010). Android: A Programmer's Guide. Tata McGraw-Hill Education Pvt. Ltd.

Laboratory Practices:

- 1: Installation and exploration of Android Studio IDE.
- 2-3: Creating project and app, running app on emulator and physical device.
- 4-5: Working with toast and log system.
- 6-7: Configuring manifest file, handling layouts.
- 8-10: Creating and switching between activities, working on apps with explicit intents, understanding activity life cycle and states.
- 11-17: Exploring and using various UI controls (text inputs, buttons, checkboxes, radio buttons, toggle buttons, switches, spinners, date and time pickers, images).
- 18-19: Creating and managing dialogs.
- 20-24: Creating and managing options menu, contextual menu, contextual action bar, popup menu.
- 25-27: Handling notifications (creating, delivering, reusing, clearing).
- 28-31: Working with shared preferences and files.
- 32-36: Creating and manipulating SQLite database.
- 37-38: Working with context providers.
- 39-40: Creating apk, publishing android app.

Certificate Course on IT Localization

Theory – 24 hrs.

Practical - 72 hrs.

Objectives:

- To acquaint the student with the process of IT Localization and issues involved in it with special emphasis in the context of Indian Languages.
- Localization - Introduction, Computing in Indian Languages, scope in Information Technology, Fonts. (3 hrs.)
- Encoding Schemes - ISCII, UNICODE (3 hrs.)
- Indian Languages in Office Automation Tools, mailing Applications etc. (2 hrs.)
- Introduction to Indian languages on WEB, Web based fonts, dynamic fonts, development of static and dynamic contents, tools supporting Indian languages. (4 hrs.)
- Indian languages and Databases, storage issues using ISCII and UNICODE (3 hrs.)
- Introduction to GNU-LINUX, Speech Applications, Machine Translation, Cross Lingual Information Retrieval, OCR in Indian Language. (7 hrs.)
- Introduction to emerging technologies and challenges. (2 hrs.)

Lab Work

- Demo of existing multilingual Applications Developed at Banasthali University, Hindi Keyboard familiarity, Working with MS Word using AkruTi & ISM. (4 hrs.)
- Working with MS Office using AkruTi & ISM, Unicode (4 hrs.)
- Enabling Indian language at Database level (8 hrs.)
- Web Page development in Indian Language (8 hrs.)

Project (48 hrs.)

Advanced Diploma in Networking

(Online Course)

Minimum contact hours: 200

Learning Outcomes: After completion of this course, the students will be able to:

- Understand OSI model of networking and different types of addressing schemes
- Configure Routers and Switches
- Understand ACL for Network Security
- Design Corporate Networks including LANs

Section A

Computer Basics, OSI model and Industry Standards, LAN, Network topologies, IP addressing, including subnet masks, Networking components and Collision Domain, Structured Cable

Section B

Routing and Addressing, Basic Network design, WANs and Routers, Router CLI, Router Components, Router Startup and Setup, Beginning Router configuration, IOS, TCP/IP, Routed and Routing Protocols

Section C

Network Troubleshooting, Advanced router configuration, LAN switching theory, VLANs, Advanced LAN and LAN switched design, Novell IPX Case studies, WAN theory and Design, WAN technology, PPP, Frame Relay, ISDN, Network trouble shooting, Case studies.

Suggested E- Resources:

- www.cisco.netacad.net

Laboratory Practices:

- To demonstrate the competencies in a TCP/IP based network using Ethernet LAN media:
- Build and test a Category 5 UTP Straight-through patch cable.
- Understand and IP addressing and subnet masking scheme for all class of network.

- Configure routers for login and enabled passwords for console.
- Physically connect Layer 1 and Layer 2 devices to router Ethernet interface.
- Configure router Ethernet interfaces for IP.
- Configure a workstation for TCP/IP communications for showing full connectivity to the router interface.
- Physically connect router serial interfaces in a back-to-back lab configuration using DCE/DTE cable combination.
- Configure routers to route IP traffic using RIP and IGRP protocol.
- Configure router serial interface using PPP encapsulation.
- Configure switch and creation of VLANs.
- Design and applied IP ACL for network security.
- Monitor network traffic using router debug commands.
- Monitor and troubleshoot network traffic using Ping, Telnet, Trace route, and debug commands.