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VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
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ક્રમાંક : એકે./પરિપત્ર/૫૮૩૨/૨૦૨૦
તા. ૨૧/૦૭/૨૦૨૦

પ્રતિ,
વડાશ્રી,
ડિપાર્ટમેન્ટ ઓફ કોમ્પ્યુટર સાયન્સ,
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,
સુરત.

વિષય :– પી.જી.ડી.સી.એ. ના પાંચ અલગ અલગ નવા અભ્યાસક્રમો અંગે.

સુજ્ઞશ્રી,

સવિનય જણાવવાનું કે,શૈક્ષણિક વર્ષ ૨૦૨૦–૨૧ થી અમલમાં આવનાર પી.જી.ડી.સી.એ. ના પાંચ અલગ અલગ નવા અભ્યાસક્રમો ફેરફારો સાથે કોમ્પ્યુટર સાયન્સ અભ્યાસસમિતિએ નવા તમામ કોર્સ ના Structure અને અભ્યાસક્રમને સ્વીકારી અને કોમ્પ્યુટર સાયન્સ અને આઈ.ટી. ફેકલ્ટીને કરેલ ભલામણ કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી તા.૨૯/૦૧/૨૦૨૦ની સભાનાં ઠરાવ ક્રમાંક: ૨ અન્વયે સ્વીકારી મંજૂર કરી તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલે તેની તા. ૩૦/૦૬/૨૦૨૦ ની સભાના ઠરાવ ક્રમાંક : ૪૨ અન્વયે મંજૂર કરેલ છે. તેની જાણ સંબંધકર્તા શિક્ષકો અને વિદ્યાર્થીઓને કરવી, તદ્ઉપરાંત તેનો અમલ કરવો.

કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજીની તા. ૨૯/૦૧/૨૦૨૦ની સભાની ભલામણ ક્રમાંક:૨

:: આથી ઠરાવવામાં આવે છેકે, કોમ્પ્યુટર સાયન્સ એન્ડ એપ્લિકેશન બોર્ડ ઓફ સ્ટડીઝ દ્વારા નિમાયેલ ડો. સ્નેહલ જોશી ની અધ્યક્ષતા માં નિયુકત પેટા અભ્યાસસમિતિએ સૂચવેલ પી.જી.ડી.સી.એ. ના પાંચ અલગ અલગ નવા અભ્યાસક્રમો રજુ કરવામાં આવેલ, તેને થોડા સામાન્ય ફેરફારો સાથે કોમ્પ્યુટર સાયન્સ અભ્યાસ સમિતિ આ નવા તમામ કોર્સ ના Structure અને અભ્યાસક્રમ સર્વાનુમતે સ્વીકારી મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૩૦/૦૬/૨૦૨૦ ની સભાનાં ઠરાવ ક્રમાંક: ૪૨

:: આથી ઠરાવવામાં આવે છે કે,કોમ્પ્યુટર સાયન્સ અભ્યાસસમિતિએ સ્વીકારેલ અને કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજીની તા.૨૯/૦૧/૨૦૨૦ ની સભાના ઠરાવ ક્રમાંક : ૨ અન્વયે ભલામણ કરેલ પી.જી.ડી.સી.એ. ના પાંચ અલગ અલગ નવા અભ્યાસક્રમો અને સ્ટ્રકચર સ્વીકારી તે મંજૂર કરવામાં આવે છે.

બિડાણ: ઉપર મુજબ

ઈ.ચા.કુલસચિવ

પ્રતિ,
૧) ડીનશ્રી, કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખા
૨) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
૩) પી.જી. વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

.....તરફ જાણ તેમજ અમલ સારૂ.

Syllabus for P.G.D.C.A.

Specialized in 5 different Tracks

Specialization in :

[Enrolled Student will opt any one of the following tracks for specialization.]

i) Database and Database Administration.
ii) Mobile Technology
iii) .NET Technology
iv) Web Technology
v) Java Technology

Submitted By:

Dr. Snehal K. Joshi (Ch.)

Dr. Ravi Gulati

Prof. Vaibhav Desai

Mr. Indravadan Sadhvani (Atul Infotech.)

Degrees Nomenclature:

a) PGDCA in Database and DBA
b) PGDCA in Mobile Technology
c) PGDCA in .NET Technology
d) PG DCA in Web Technology
e) PGDCA in Java Technology

[Syllabus is designed looking at the current need of industry with a purpose to increase employability of the student. After graduation, one year of P.G. Diploma in special field can give deep insight about the subject and enhance technical knowledge.]

Syllabus framework for P.G.D.C.A.

Course Name: **Post Graduate Diploma in Computer Application**

Specialization in :

[Enrolled Student will opt any one of the following tracks for specialization.]

vi) Database and Database Administration.
vii) Mobile Technology
viii) .NET Technology
ix) Web Technology
x) Java Technology

Degrees Nomenclature:

f) PGDCA in Database and DBA
g) PGDCA in Mobile Technology
h) PGDCA in .NET Technology
i) PG DCA in Web Technology
j) PGDCA in Java Technology

Eligibility Criteria :

B.C.A. / B.Sc.(Computer Science) / B.Sc.(I.T.)
[B.Sc.(Statistics/Physics/Maths) / B.Com. / B.B.A.] (Minimum 45% at Graduation)
M.Sc.(C.A.)/ M.Sc.(ICT / I.T. / Physics / Maths /Statistics) / M.C.A. / M.Com. / M.B.A./B.E.(Any Stream)

Pre-Requisite:
Fundamental knowledge of Programming, concepts of compiler or interpreter based languages, Concepts of Operating systems.

Max. Intake : 40 Students
Suggested Fees : Rs. 15,000/- per Semester. [Total Course Fees: Rs.45,000/-]
OR Rs. 500/- per credit course.

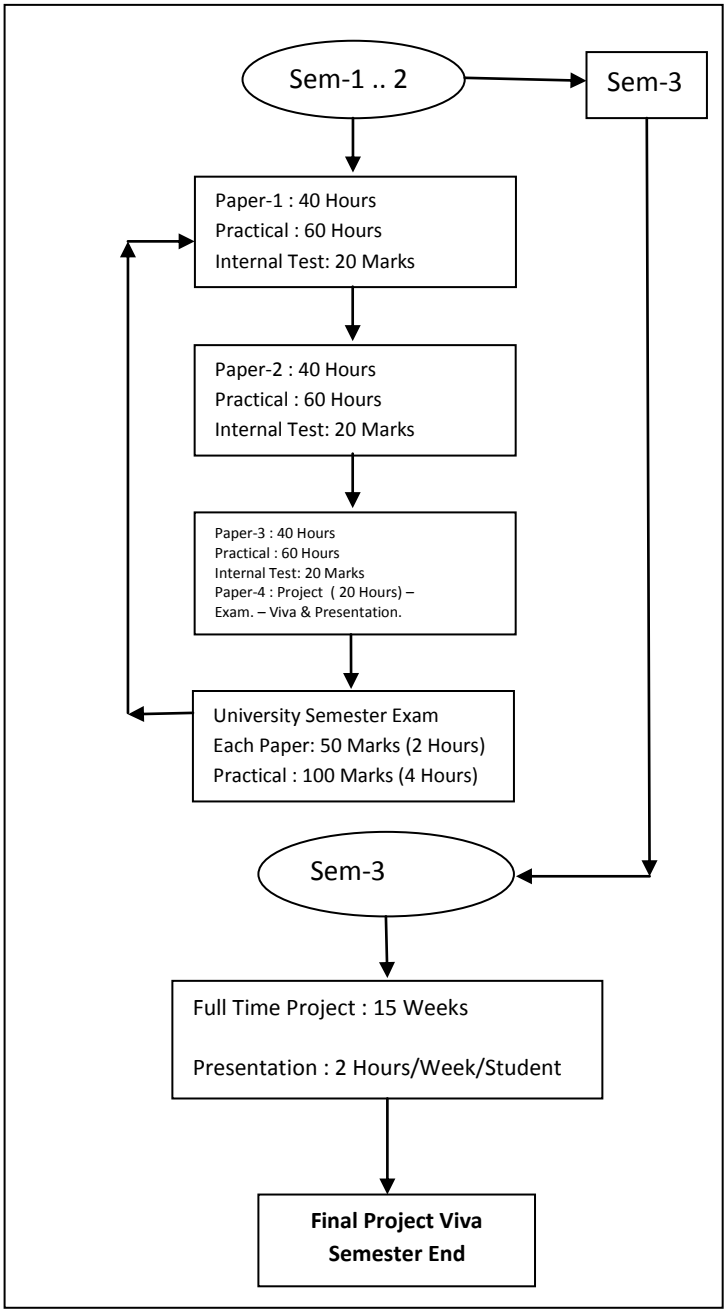
Admission Procedure :
Category-I : 50% seats equally divided among V.N.S.G.U. students of B.C.A. / B.Sc.(Computer Sci.)/ B.Sc.(I.T.) based on their merit as per the admission matrix following the norms of V.N.S.G.U.
Vacant seats will be filled by the other category (i.e. If B.C.A. seats are vacant, it will be filled by B.Sc.(Comp.)/B.Sc.(I.T.) and vice-versa) and then by Category-II.

Category-II: 50% seats for rest all including other university students based on their entrance score.
Vacant seats in this category will be converted to Category-I.

Infrastructure Requirements:

Hardware:
- 20 Computers with minimum i3 processor and 16 GB RAM.
- One Server with 32 GB RAM.
- Wi-Fi and Internet facility on all computers in Lab.
- One High Speed Printer (30 ppm) OR Two Laserjet printers.
- One Class-room with 40 sitting capacity and DLP/LCD/LED projector.

Course Flow :



Exam Pattern:

Internal : Continuous Evaluation - 1 Internal MCQ Test(20 marks) for Each Subject.

- 1 Assignment per subject.
- 1 Internal Project and Practical Journal.

External (University Exam) :

Theory Subjects (Paper-1 to Paper-3) : 50 Marks
(25 marks MCQ + 25 Marks Descriptive)
(Duration: 90 Minutes)

Project Exam (Paper-4) : 50 Marks (Viva and Presentation of Project)

Practical Exam (Paper-5) : 140 Marks (5 Hours Duration).

Ratio of Marks :

Internal : 30 % , External : 70%

Implementation System: First Semester: 15 Weeks (Teaching/Learning/Practical/Exam)
Second Semester: 15 Weeks (Teaching/Learning/Practical/Exam)
Third Semester: 15 Weeks (Project/Exam)

Sem-1	Paper Code	Total Hours	Credit	Exam Type	Max. Marks
	101	40 Hours	4	Theory	50
	102	40 Hours	4	Theory	50
	103	40 Hours	4	Theory	50
	104 (Project & Technical Skills)	20 Hours	4	Theory/Practical	50
	105 (Practical)	180 Hours	16	Practical	200
		Total Credits:	32	Total Marks:	400 Marks

Sem-2	Paper Code	Total Hours	Credit	Exam Type	Max. Marks
	201	40 Hours	4	Theory	50
	202	40 Hours	4	Theory	50
	203	40 Hours	4	Theory	50
	204(Project & Technical Skills)	20 Hours	4	Theory/Practical	50
	205(Practical)	180 Hours	16	Practical	200
		Total Credits:	32	Total Marks:	400 Marks

Sem-3	Paper Code	Total Hours	Credit	Exam Type	Max. Marks
	301	Full Time Project	30	Project and Viva	350
	302 (Technical Skills)	20 Hours	2	Presentation	50
		Total Credits:	32	Total Marks:	400 Marks

Work-Load :

Semester	Theory	Practical	Contact Hours	Total
Sem-1	12 Hours	20 Hours	-	32 Hours / Week
Sem-2	12 Hours	20 Hours	-	32 Hours / Week
Sem-3	2 Hours		2 Hours	4 Hours / Week (per 5 Students)

Lab. Batch Size for Practical : 20 students.

Staff Requirement (Per Division):

1) Associate Professor – 01 Post.
2) Assistant Professor – 01 Post.
3) Lab. Assistant - 01 Post.

[In case Associate Professor is not available, 01 Assistant Professor can be recruited subject to recruiting Associate Professor within 3 years from the Date of commencement of the Program. In failure to have staff as per the norms within 3 years from the commencement of the program, the affiliation should be cancelled for this program.]

Syllabus – I : P.G.D.C.A. in Database & DBA

Short Title: PGDCA in Database &DBA

Duration: 12 Months (1 Year)

Objective: This course is aimed to enhance practical oriented knowledge and emphasis more on practical knowledge instead of working on too much of theory knowledge. After graduation, students gain edge on Database and Database Administration starting from fundamental to the most advance level. After passing out from this course, students are prepared to work at Database level in software industry.

Implementation System:

First Semester: 15 Weeks (Teaching/Learning/Practical/Exam)

Second Semester: 15 Weeks (Teaching/Learning/Practical/Exam)

Third Semester: 15 Weeks (Project/Exam)

Sem-1	Paper Code	Total Hours	Credit	Exam Type	Max. Marks
	101	40 Hours	4	Theory	50
	102	40 Hours	4	Theory	50
	103	40 Hours	4	Theory	50
	104 (Project & Technical Skills)	20 Hours	4	Theory/Practical	50
	105 (Practical)	180 Hours	16	Practical	200
		Total Credits:	32	Total Marks:	400 Marks

Sem-2	Paper Code	Total Hours	Credit	Exam Type	Max. Marks
	201	40 Hours	4	Theory	50
	202	40 Hours	4	Theory	50
	203	40 Hours	4	Theory	50
	204(Project & Technical Skills)	20 Hours	4	Theory/Practical	50
	205(Practical)	180 Hours	16	Practical	200
		Total Credits:	32	Total Marks:	400 Marks

Sem-3	Paper Code	Total Hours	Credit	Exam Type	Max. Marks
	301	Full Time Project	28	Project and Viva	350
	302	20 Hours	4	Presentation & Technical Skills	50
		Total Credits:	32	Total Marks:	400 Marks

Semester : 1 :

Paper – 101 : Fundamentals of Programming and Database [Theory: 40 Hours, Practical: 60 Hours]

Objective : Brush-up for the computer background students and essential knowledge for novices. This paper aims to cover basics of programming skills and database management system.

Content:

Python Programming skill : (12 Hours of Theory + 15 Hours of Practical)
Python Libraries (Numpy,Pandas,Scipy) and Data-structure : (14 Hours of Theory + 15 Hours of Practical)
Database Concepts and SQL (14 hours theory + 30 hours of Practical)

Unit-1 :

Python Programming : Python Overview, Environment Setup, Basic Syntax, Variable types, Operators, Decision Makin Statements, Loops

Unit-2 : Python Libraries and Data Structure

Numbers and String Functions, Lists, Tuples, Dictionary,
User-defined functions, File I/O.

Unit-3 :

Concepts of Database: (Database Management System, Characteristics of DBMS, Advantages and Disadvantages of DBMS, DBMS vs. File System, DBMS Architecture, Three schema Architecture, Data Model Schema, Data Independence)

Unit-4 :

Fundamentals of SQL : (SQL Introduction, Concepts of Query languages, Characteristics of SQL, Advantage of SQL, SQL Datatype, SQL Commands, Types of Query Languages, keys
SQL Table: What is Table, TABLE Variable, CREATE TABLE, DROP TABLE, DELETE TABLE, RENAME TABLE, TRUNCATE TABLE, COPY TABLE, TEMP TABLE, ALTER TABLE.
SQL Select: SELECT Statement, SELECT TOP, SELECT FIRST, SELECT LAST, SELECT RANDOM, SELECT AS, SELECT IN, SELECT Multiple, SELECT DATE, SELECT SUM,SELECT NULL. SQL Clause: SQL WHERE, AND, OR, WITH , AS. SQL Order By : ORDER BY Clause, ORDER BY ASC, ORDER BY DESC, ORDER BY RANDOM, ORDER BY LIMIT, ORDER BY Multiple Cols. SQL Insert: INSERT Statement, INSERT INTO Values, INSERT INTO SELECT, INSERT Multiple Rows. SQL Update: UPDATE Statement, SQL UPDATE JOIN, SQL UPDATE DATE.
SQL Delete: DELETE Statement, SQL DELETE TABLE, SQL DELETE ROW, SQL DELETE All Rows, DELETE Duplicate Rows, SQL DELETE DATABASE, SQL DELETE VIEW, SQL DELETE JOIN. SQL Join: SQL JOIN, SQL Outer Join, SQL Left Join, SQL Right Join, SQL Full Join, SQL Cross Join. SQL Keys: Primary Key, Foreign Key, Composite Key, Unique Key, Alternate Key. Difference between SQL vs NoSQL)

Paper-102 : RDBMS : [Theory: 40 Hours, Practical: 60 Hours]

Unit-1 : [Theory: 10 Hours]

Relational data Model: (Relational Model concept, Keys, Relational Algebra, Join Operation, Integrity Constraints, Relational Calculus, Normalization (Up to BCNF) , Relational Decomposition, Multivalve Dependency, Join Dependency, Inclusion Dependence.)

Unit-2 : [Theory :10 Hours]

PL/SQL Datatypes, Control Statements : (PL/SQL IF, PL/SQL Case, PL/SQL Loop, PL/SQL Exit Loop, PL/SQL While Loop, PL/SQL For Loop, PL/SQL Continue, PL/SQL GOTO.), PL/SQL Procedure, PL/SQL Function.

Unit-3 : [Theory: 10 Hours]

PL/SQL Cursor (Types of Cursors) , PL/SQL Exception handling, PL/SQL Triggers, Grant, Revoke.
Installing the Oracle Database Software , Core DBA tasks and tools, Plan an Oracle installation,
Use optimal flexible architecture, Install software with the Oracle Universal Installer (OUI)

Creating an Oracle Database , Create a database with the Database Configuration Assistant (DBCA), Create a database design template with the DBCA, Generate database creation scripts with the DBCA. Starting and Shutting down Database.

Unit-4 : **[Theory: 10 Hours]**

Managing the Oracle Instance, Start and stop the Oracle database and components, Use Enterprise Manager (EM), Access a database with SQL*Plus and iSQL*Plus, Modify database initialization parameters, Understand the stages of database startup, View the Alert log, Use the Data Dictionary.

Paper-103 : Oracle database Fundamentals : [Theory: 40 Hours, Practical: 60 Hours]

Unit-1 : **[Theory: 10 Hours]**

Role of DBA, OLTP vs OLAP Databases, Oracle 11g and Oracle 12c fundamentals, Undo vs Redo Data, Instance vs Database, Process Architecture, Log Writer Process, Checkpoint Process, SMON Process, PMON Process, RECO Process., Achiever Process.

Unit-2 :

Memory Architecture , Database Buffer Cache, Shared pool, REDO log Buffer, large pool, Java pool and Streams Pool, Keep Buffer pool, Recycle Buffer pool, nK Buffer Cache, PGA(Program Global Area), Dedicated and Shared Database, PGA in Shared Environment.

Unit-3 :

Tablespace concepts, Online and Offline tablespaces, Create tablespace, adding space to table space, Block size allocation in Tablespace, Temporary tablespace and tablespace groups, Extent management.

Unit-4 :

UNDO and REDO management, Archival concepts , Archival Log Mode. Privileges (System, Object), Revoking Privileges, Role Management, User Profiles, Manageing passwords using profiles.

Paper-104 : Project & Technical skills: [Lab Hours: 20 Hours]

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-105 : Practical : [Lab Hours: 180 Hours]

Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-101 to 103.

Semester – 2 :

Paper-201 : Advanced PL/SQL and Database Tuning : (Theory: 40 Hours)

Unit-1 : PL/SQL Objects : **[Theory: 8 Hours, Practical: 8 Hours]**
Packages , PL/SQL collection types (PL/SQL provides three collection types − Index-by tables(associative array), Nested tables, Variable-size array (Varray), synonyms, table-space.

Unit-2 : Creating an Oracle Database: **[Theory: 6 Hours, Practical: 12 Hours]**
Create a database with the Database Configuration Assistant (DBCA)
Create a database design template with the DBCA
Generate database creation scripts with the DBCA , create users and grant privileges and rights.

Unit-3: Managing the Oracle Instance: **[Theory: 12 Hours, Practical: 10 Hours]**
Start and stop the Oracle database and components, Use Enterprise Manager (EM), Access a database with SQL*Plus and iSQL*Plus, Modify database initialization parameters, Understand the stages of database startup, View the Alert log, Use the Data Dictionary, Networking Concepts, Listener Configuration, TNSNAMES Configuration, Public and Private Database, Database Link.

Unit-4: Managing Database Storage Structures **[Theory: 14 Hours, Practical: 10 Hours]**
Describe table data storage (in blocks), Define the purpose of tables-paces and data files, Understand and utilize Oracle Managed Files (OMF), Create and manage tablespaces, Obtain tablespace information, Describe the main concepts and functionality of Automatic Storage Management (ASM)

Paper-202 : Database Administration and Security :

Unit-1 : **(Theory: 10 Hours, Practical: 10 Horus)**
Administering User Security (Create and manage database user accounts, Authenticate users,
Assign default storage areas (tablespaces), Grant and revoke privileges, Create and manage roles, Create and manage profiles, Implement standard password security features, Control resource usage by users)
Managing Schema Objects (Define schema objects and data types, Create and modify tables, Define constraints, View the columns and contents of a table, Create indexes, views and sequences, Explain the use of temporary tables, Use the Data Dictionary, Manage data through SQL, Monitor and resolve locking conflicts)

Unit-2 : **(Theory: 10 Hours, Practical: 12 Horus)**
Managing Undo Data: (Explain DML and undo data generation, Monitor and administer undo, Describe the difference between undo and redo data, Configure undo retention, Guarantee undo retention, Use the undo advisor, Implementing Oracle Database Security, Describe DBA responsibilities for security, Apply the principal of least privilege, Enable standard database auditing, Specify audit options, Review audit information, Maintain audit trial)
Configuring the Oracle Network Environment: (Create additional listeners, Create Net Service aliases, Configure connect-time failover, Control the Oracle Net Listener, Test Oracle Net connectivity, Identify when to use shared versus dedicated servers.)

Unit-3 : **(Theory: 10 Hours, Practical: 13 Horus)**
Backup and Recovery Concepts (Identify the types of failure that may occur in an Oracle Database, Describe ways to tune instance recovery, Identify the importance of checkpoints, redo log files, and archived log files, Configure ARCHIVELOG mode, Performing Database Backups, Create consistent database backups, Back your database up without shutting it down, Create incremental backups, Automate database backups, Monitor the flash recovery area)

Unit-4 : **(Theory: 10 Hours, Practical: 10 Horus)**
Performing Database Recovery: (Recover from loss of a control file, Recover from loss of a redo log file, Perform complete recovery following the loss of a data file)
Performing Flashback: (Describe Flashback database, Restore the table content to a specific point in the past with Flashback Table, Recover from a dropped table, View the contents of the database as of any single point

in time with Flashback Query, See versions of a row over time with Flashback Versions Query, View the transaction history of a row with Flashback Transaction Query)

Paper-203 : Database configuration and Recovery: (Theory : 40 Hours)

Unit-1 :

Moving Data (Describe available ways for moving data, Create and use directory objects, Use SQL*Loader to load data from a non-Oracle database (or user files), Explain the general architecture of Data Pump, Use Data Pump Export and Import to move data between Oracle databases, Use external tables to move data via platform-independent files,

Configuring Recovery Manager: (Recovery Manager Features and Components, Using a Flash Recovery Area with RMAN, Configuring RMAN, Control File Autobackups, Retention Policies and Channel Allocation,

Using Recovery Manager to connect to a target database in default NOCATALOG mode, Displaying the current RMAN configuration settings, Altering the backup retention policy for a database

Unit-2 :

Using Recovery Manager (RMAN Command Overview, Parallelization of Backup Sets, Compressed Backups, Image Copy, Whole Database and Incremental Backups, LIST and REPORT commands, Enable ARCHIVELOG mode for the database, Use Recovery Manager)

Recovering from Non-critical Losses: (Recovery of Non-Critical Files, Creating New Temporary Tablespace, Recreating Redo Log Files, Index Tablespaces, and Indexes, Read-Only Tablespace Recovery, Authentication Methods for Database Administrators, Loss of Password Authentication File, Creating a new temporary tablespace)

Incomplete Recovery: (Recovery Steps, Server and User Managed Recovery commands, Recovering a Control File Autobackup, Creating a New Control File, Incomplete Recovery Overview, Incomplete Recovery Best Practices, Simplified Recovery Through RESETLOGS, Point-in-time recovery using RMAN)

Unit-3 :

Flashback: (Flashback Database Architecture, Configuring and Monitoring Flashback Database, Backing Up the Flash Recovery Area, Using V$FLASH_RECOVERY_AREA_USAGE, Flashback Database Considerations, Using the Flashback Database RMAN interface, Using Flashback Database EM Interface, Managing and monitoring Flashback Database operations)

Dealing with Database Corruption: (Block Corruption Symptoms: ORA-1578, DBVERIFY Utility and the ANALYZE command, Initialization parameter DB_BLOCK_CHECKING, Segment Metadata Dump and Verification, Using Flashback for Logical Corruption and using DBMS_REPAIR, Block Media Recovery, RMAN BMR Interface, Dumping and Verifying Segment Metadata)

Unit-4 :

Monitoring and Managing Storage (Database Storage Structures, Space Management Overview, Oracle-Managed Files (OMF), Row Chaining and Migrating, Proactive Tablespace Monitoring, Managing Resumable Space Allocation, SYSAUX Tablespace, Monitoring table and index space usage)

Monitoring and Managing Storage-II : (Automatic Undo Management, Redo Log Files, Table Types, Partitioned Tables, Index-Organized Tables (IOT), Managing index space with SQL, Configure optimal redo log file size, View “Automatic Tuning of Undo Retention”)

Paper-204 : Technical Skill : [Lab Hours: 20 Hours]

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-205 : Practical : [Lab Hours: 180 Hours]

Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-201 to 203.

Semester – 3 :

301 : Project : [Full Time]

Student will undergo full time project based on the database. The nature of Project will be full-Time. Student will report about their progress to internal guide every week.

302: Presentation & Technical Skills: [2 Hours per Week]

Students will undergo two online certification of their choice from the list of certification (MOOC) list. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, the same will be considered for claiming 2 credits for each course.

Student will prepare and present the presentation based on the MOOC course on which the certification and credits are claimed.

Course Name : PGDCA (Specialization in Java Technology) :

Pre-requisite: Concepts of c Programming, OOPs concepts.

Semester- I

Paper-101 : Fundamentals of Java Programming :

Unit-1: Introduces programming fundamentals:

- Problem solving
- Primitive data types and arithmetic expressions
- Object-oriented programming basics
- Branching and Loops
- Java Methods and Fields
- Java Exception Handling

Unit-2:

- Java Classes and OOPs
- Arrays
- Java Link Lists
- String and StringBuilders
- File I/O
- Simple event-driven programming
- Recursion
- Abstract data types

Unit-3:

- Java Polymorphism & Inheritance
- Java Interfaces Abstract Classes
- Java Object Class
- Java Exception handling.
- Java Threads
- Exception and Errors.

Unit-4 :

- Java Swing
- Java Swing layout managers
- Java Swing Component
- Java file
- Java Read & Write files
- Java Read & Write Binary Search

Paper-102 : Java Collection Framework and Cloud Services:

Unit-1 :

- Java Database, Java solving error
- Java JTable and MySQL
- Swing & JEditorpane, Java JApplet
- Java 2D Graphics
- Java paint application Java collision detection with polygons

Unit-2 :

- Java OOP design principles, ArrayList , LinkedList and the List Interface
- HashMap , Sorted Maps and the Map Interface , Sets
- Using user defined Objects in Sets and Maps

- Sorting Lists using Comparators
- Natural Ordering and the Comparable Interface
- Queues , Using Iterators Implementing Iterable; Downloading Web Pages
- Deciding Which Java Collection to Use, Complex Data Structures

Unit-3 :

- Communication Protocols, Introduction to HTTP
- Cloud Service
- HTTP Request Methods , HTTP Request Anatomy
- URLs & Query Parameters , Mime Types & Content Type Headers
- Request Body Encoding
- HTTP Response Anatomy, HTTP Response Codes , Cookies
- Protocol Layering & HTTP Design Methodologies , HTTP Polling,
- REST , Push Messaging

Unit-4 :

- Servlets
- A First Cloud Service with a Servlet Request Routing and Web.xml
- Video Servlet Walkthrough
- Securely Handling Client Data & Avoiding Injection Attacks
- Building Cloud Services on HTTP

Paper-103 : Struts 2 Framework

Unit-1. INTRODUCTION TO STRUTS 2 FRAMEWORK

1.1 Struts 2 Overview,
1.2 Why use Struts framework for web applications
1.3 Struts 2 declarative architecture and Implementation of MVC
1.4 Processing Request
1.5 Model – Action
1.6 View – Result
1.7 Interceptors
1.8 Exception Handling
1.9 The ValueStack and ONGL

Unit-2. WORKING WITH STRUTS 2 APPLICATION

2.1 Struts 2 Configurations
2.2 Introducing Struts 2 Actions, Struts 2 Results
2.3 Packaging actions, Implementing actions
2.4 Transferring data onto objects

Unit-3. OGNL(Object Graphic Navigational Language)

3.1 Concepts of OGNL, OGNL in Struts and Where OGNL is Used
3.2 The common tasks in a web application
3.3 Data transfer and type conversion, Built-in type converters
3.4 Customizing type conversion

Unit - 4. ADDING WORKFLOW WITH INTERCEPTORS

4.1 Purpose of intercept requests, Interceptors in action
4.2 Surveying the built-in Struts 2 interceptors
4.3 Declaring interceptors, Building interceptor
4.4 Getting familiar with the validation framework
4.4.1 Wiring your actions for validation
4.4.2 Validation framework advanced topics
4.5 STRUST 2 TAGS
4.5.1 An overview of Struts tags, Types of Tags
4.5..2 Data Tags, Control tags
4.5.3 Purpose of UI component tags

Paper-104 : Project & Technical skills: **[Lab Hours: 20 Hours]**

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-105 : Practical : **[Lab Hours: 180 Hours]**
Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-101 to 103.

SEMESTER- 2:

Paper-201 : Javascript, JQuery JSON & Introduction of Struts 2 Framework:

Unit-1 :

Basic of JavaScript
JavaScript - Core Language Features
JavaScript - Variables and Expressions
JavaScript - Arrays and Control Structures
JavaScript - Document Object Model(DOM)
JavaScript - Object Oriented Concepts, Object Life Cycle
Installing MAMP and XAMPP

Unit-2 :

Using NGrok with the Autograder
Using LocalTunnel with the Autograder
jQuery Basics
Forms and jQuery
Profiles, Positions and JQuery
JavaScript Object Notation (JSON), JSON and jQuery
JSON Chat, JSON CRUD. Profile, Positions, Education, and JSON

Unit-3 :

Introduction to Sturts Framework
Struts 2 Overview
Why use Struts framework for web applications
Struts 2 declarative architecture and Implementation of MVC
Processing Request
Model – Action, View – Result
Interceptors, Exception Handling
The ValueStack and ONGL

Unit-4 :

Working with Struts 2 Application : Struts 2 Configurations, Introducing Struts 2 Actions, Struts 2 Results, Packaging your actions, Implementing actions
Transferring data onto objects
OGNLConcepts
OGNL in Struts and application of OGNL
The common tasks in a web application, Data transfer and type conversion
Built-in type converters, Customizing type conversion

Paper-202 : STRUTS and HIBERNET FRAMEWORK:

Unit-1 : ADDING WORKFLOW WITH INTERCEPTORS

1.1 Why intercept requests?
1.2 Interceptors in action
1.3 Surveying the built-in Struts 2 interceptors
1.4 Declaring interceptors
1.5 Building your own interceptor
1.6 STRUTS 2 VALIDATION FRAMEWORK
1.7 Getting familiar with the validation framework
1.8 Wiring your actions for validation
1.9 Validation framework advanced topics

Unit-2 : STRUST 2 TAGS

- An overview of Struts tags
- Types of Tags, Data Tags, Control tags
- Purpose of UI component tags
- STRUST 2 INTEGRATION & PERSISTENCE LAYER
- Overview of JDBC, Connecting to the DataBase
- Submitting the SQL statements
- Retrieving and processing data
- DB_Action Class, Data Access Object
- Integrating Struts2 with Hibernate, Internationalization
- The default local determination

Unit-3 : **Hibernate Architecture Overview**

3.1 Introduction to Hibernate
3.2 ORM Overview
3.3 Hibernate Architecture and API
3.4 Hibernate Environment/Setup
3.5 Hibernate Configuration
3.5.1 hibernate.cfg.xml file
3.5.3 SessionFactory, Configuration class, Session Interface
3.5.4 Mapping Files
3.6 Hibernate with Annotations

Unit-4 : Querying

3.1 HQL – Hibernate Query Language Overview
3.2 HQL Basics, HQL Expressions, HQL Functions
3.3 Using queries: HQL, criteria API, native (SQL)
3.4 Association Mappings
3.5.1. Unidirectional associations with join tables
3.5.1. One-to-many
3.5.2 Many-to-one
3.5.3 One-to-one
3.5.4. Many-to-many
3.6 Bidirectional associations with join tables
3.6.1 one-to-many / many-to-one
3.6.2. one to one, Many-to-many
3.7 Collection Mapping

Paper-203 : Spring Framework:

Unit-1 : Spring Framework Introduction

1.1 What is Spring & Why use Spring?, Concepts of Spring & its Architecture
1.2 Introduction to Spring modules, Spring Environment Setup
1.3 Spring Bean Definition, Lifecycle of Bean, Bean Scopes
1.4 Inner Bean, Collection Bean, Bean Reference, Bean Definition Inheritance
1.5 Dependency Injection (DI)& Inversion of Control (IoC)

Unit-2 : Spring IoC – Dependencies Injection

2.1 Dependency Injection in Spring
2.1.1 Spring Setter Injection
2.1.2 Spring Constructor Injection
2.1.3 Spring Auto Wiring
2.1.3.1 Autowiring By Type,By Name, By Constructor,By AutoDetect

2.2 Spring AOP
- 2.2.1 Aspect Oriented Programming Overview
- 2.2.2 The Real Problem and Solutions through AOP
- 2.2.3 Spring AOP Terminology, AOP Advice Types, Creating Advices in Spring

Unit-3 : Spring 3 Web MVC

3.1 Introduction to Spring 3.0 MVC framework & Configuration
3.2 Spring Annotation Based Controllers
3.3 Creating an Application in Spring 3.0 MVC
3.4 Handling Forms in Spring 3.0 MVC
3.5 Spring Validation Framework
3.6 Spring Interceptors

Unit-4 :Accessing Relational Data using JDBC with Spring – Spring JdbcTemplate

4.1 Spring JDBC Complete Introduction & Advantages
4.2 Centralized Classes of Spring JDBC
4.3 Using Spring JDBC Template
4.4 Spring JdbcTemplate Select Query
4.5 About execute() Method Of Spring JdbcTemplate Class
4.6 About update() Method Of Spring JdbcTemplate Class
4.7 Spring MVC JDBC Example
4.8 Spring with ORM
4.9 Integrating Spring with Hibernate

Paper-204 : Project & Technical skills: **[Lab Hours: 20 Hours]**

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-205 : Practical : **[Lab Hours: 180 Hours]**

Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-201 to 203.

Semester – 3 :

301 : Project : **[Full Time]**

Student will undergo full time project based on the Java Technology / Framework. The nature of Project will be full-Time. Student will report about their progress to internal guide every week.

302: Presentation & Technical Skills: **[2 Hours per Week]**

Students will undergo two online certification of their choice from the list of certification (MOOC) list. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, the same will be considered for claiming 2 credits for each course.

Student will prepare and present the presentation based on the MOOC course on which the certification and credits are claimed.

Course Name: P.G.D.C.A. (Specialization in .NET Technology)

Objective : To make students aware of .Net framework and develop applications using VB .NET and C# .NET. They will also understand the concept of Web Technology and advance topics like LINQ, MVC and different types of Reports.

Pre-requisite : Basic knowledge of Programming concepts, HTML and Scripting Languages.

Semester – I :

Paper 101- .NET Framework & IDE

Unit-1 Overview
- Introduction to .NET Framework
- MSIL
- Common Language Runtime (CLR)
- CLS
- CTS
- Class Libraries

Unit-2 Building .Net
- Use of Windows Forms
- Use of Web Forms
- Use of Web Services
- Use of Console Applications

Unit-3 Advantages of CLR
- Re-use code
- Multiple Language Support
- Cross Language Interoperability
- Garbage Collection

Unit-4 Introduction to VB .Net
- Tokens : Variables, Constants, Operators, Data types
- Built in Functions and User defined Functions
- Conditional and Looping Statements
- MsgBox and InputBox
- Arrays and Collections
- Toolbox Common Controls - Label, Text Box, Button, Check Box, Radio Button, Date Time Picker, List Box, Combo box, Picture Box, Rich Text Box, Tree View, Tool Tip, Progress bar, Masked Text box, Notify Icon, Link Label, Checked List box

Unit-5. Advanced VB .Net Controls
- Container Controls
- Data Controls - Data Set, Data Grid
- Component - Image list, error provider, Help provider,
- Timer
- Working with Menus and Dialog boxes

Paper-102 (Extended VB. NET)

Unit-1 :Collections

- ArrayList
- Hashtable
- SortedList
- Stack
- Queue
- BitArray

Unit-2 : Functions and SubProcedures

- Defining a Function
- Function Returning Value
- Recursive Function
- Param Array
- Passing Array as Function Argument
- Defining a Sub Procedure
- Passing Parameter by value and reference

Unit-3 :Exception Handling

- Structured Error Handling
- Unstructured Error Handling

Unit-4. Object Oriented Programming

- Creating Classes, Object Construction & Destruction
    - Properties, Methods, Events
    - Access Specifiers: Public, Private, Protected, Protected, Friend
    - Me, MyBase and MyClass keywords
- Abstraction, Encapsulation & Polymorphism
- Interfaces & Inheritance

Unit-5. Database access using ADO.NET

- Visual Database Tools
- ADO .NET Object Model
- ADO .NET Programming

Paper- 103 (C# .NET)

Unit-1 Introduction

- The Creation of C#
- The Evolution of C#

Unit-2.Language and Syntax Enhancements

- C# Language Fundamentals
- ARRAYS
- Decision making
- Loops
- Methods

Unit-3. Using Object-Oriented Programming in C# .NET

- Object Oriented Concepts
- Boxing
- Delegates

- Events
- Interfaces

Unit-4. Using Forms

- Windows Forms
- Input, Output, and Serialization
- Processes, App Domains, Contexts, Threading,
- Type Reflection, Late Binding, Attribute-based programming.

Unit-5. I/O Streams

- What is streams?
- Types of stream
- Standard I/O streams – Console
- Handling text in files
- Dealing with Binary files
- Serialization / Deserialization

Paper-104 : Project & Technical skills: [Lab Hours: 20 Hours]

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-105 : Practical : [Lab Hours: 180 Hours]

Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-101 to 103.

Semester - II

Paper 201 : ASP .NET

Unit-1.

- ASP .NET Features
- Building an ASP.NET Web Site
- Code Behind and Inline Code
- Controls : Grid View, List Box, Data list, Repeater, Form view, Web Server Controls, Html Server Controls
- Master Pages
- CSS for ASP .NET 3.5

Unit-2. Web based Application Development

- Control Events and Event Handlers
- Validation Controls
- User Control
- Database Access using ADO.NET
- Session and Cookie Management

Unit-3. Deploying Applications

- Overview of XML
- Introduction to web services
- Describing Assemblies
- Deploying Applications

Working with AJAX

- Client side and Server side AJAX
- AJAX Toolkit

Unit-4. Accessing LINQ Controls

- LINQ Language Features
- Object Initialization
- Anonymous Types
- Implicitly Typed local variables
- Lamda expression
- Query expression
- LINQ to objects
- LINQ to SQL
- LINQ to entities

Paper-202 : ASP .NET MVC

Unit-1. Introduction to ASP.NET MVC

- The MVC Pattern
- Web Standards and REST
- Architecture
- Disadvantages
- ASP.NET MVC vs. Web Forms

Unit-2. Essential Language Features

- Automatically Implemented Properties
- Using Object and Collection Initializes
- Entity Framework

Building the Model

- Microsoft Data Access Options
- Repository Pattern
- Validation and Business Rule Logic
- Familiarizing yourself with ASP.NET MVC classes(namespace)

Unit-3. Routes and URLs

- Introduction to Routing
- Defining Routes
- Constraints
- Areas
- Ignoring Routes

Unit-4.Controllers

- IController and ControllerBase
- Action Methods
- Working with Parameters
- Action Result Types
- HTTP Verbs
- Asynchronous Actions
- ViewData and TempData
- Model Binders

Paper-203 Advanced MVC and Reports:

Unit-1. Views and View Templates

- Defining Views
- ASP.NET View Engine
- Razor View Engine
- ViewData
- Strongly-Typed Views
- Using a ViewModel
- Remote Validator

Unit-2. HTML Helper Methods

- Strongly-Typed Helpers
- Html.ActionLink & HTML Forms
- List Controls
- WebGrid
- Validation

Partials and Master Pages

- Master Pages & User Controls
- Partial and RenderPartial
- Action and RenderAction

Unit-3: Securing MVC applications

- Securing your MVC Application
- Walkthrough: Using Forms Authentication in ASP.NET MVC
- Authorize Attribute class
- Preventing JavaScript Injection (XSS) Attacks

Unit-4: Reports

- Report by using Report Viewer
- Crystal Report
- RDLC Report

Paper-204 : Project & Technical skills: [Lab Hours: 20 Hours]

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-205 : Practical : [Lab Hours: 180 Hours]

Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-201 to 203.

Semester – 3 :

301 : Project : [Full Time]

Student will undergo full time project based on the Java Technology / Framework. The nature of Project will be full-Time. Student will report about their progress to internal guide every week.

302: Presentation & Technical Skills: [2 Hours per Week]

Students will undergo two online certification of their choice from the list of certification (MOOC) list. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, the same will be considered for claiming 2 credits for each course.

Student will prepare and present the presentation based on the MOOC course on which the certification and credits are claimed.

Reference Books

1. Visual Basic .NET Programming (Black Book) - By Steven Son Holzner, DreamTech Publication
2. Mastering Visual Basic.NET - By Evangelos Petroutsos, BPB Publication
3. Moving to VB.NET : Stategies, Concepts, and Code - By Dan Appleman, Apress Publication
4. Microsoft Visual Basic .NET Step by Step - By Michael Halvorson, PHI Publication
5. Database Programming with Visual Basic.NET and ADO.NET – By F.Scott Barker, Sams Publication
6. Beginning .NET Web Services Using Visual Basic .NET - By Joe Bustos and Karlli Waston, Wrox Publication
7. .NET – Complete Development Cycle - By G. Lenz, T. Moeller, Pearson Education
8. Professional VB.NET, 2nd Edition - By Fred Barwell, et al, Wrox Publication
9. Teaching Methodology ASP.NET – A Beginner's Guide - By Dave Mercer, TMH
10. ASP.NET Bible – By Mridula Parihar et. Al., Wiley India
11. Programming ASP.NET 4 – By Dino Esposito, Microsoft Press
12. Professional ADO.NET – By Bipin Joshi, Donny Mack, Doug Seven,Fabio Claudio Ferracchiati, Jan D Narkiewiez, Wrox Publication
13. ASP.NET for Developers – By Amundsen
14. The Complete Reference ASP.NET – By Matthew MacDonald –TMH
15. ASP.NET – Black Book – DreamTech
16. Beginning ASP.NET 3.5 in C# and VB – By Imar Spaanjaars ,Wrox
17. Professional ASP.NET 3.5 AJAX - By Bill Evjen, Dan Wahlin, David Reed, and Matt Gibbs, Wrox Publication
18. Ajax: The Complete Reference 1st Edition - By Thomas A. Powell, Osborne Publication
19. Ajax For Dummies - By Steve Holzner
20. Programming Microsoft LINQ in .NET Framework 4 - By Paolo Pialorsi, Marco Russo, Microsoft Press
21. Pro ASP.NET MVC 5 - By Adam Freeman, APress Publication
22. Essential Angular for ASP.NET Core MVC - By Adam Freeman, Apress Publication
23. Professional Crystal Reports for VS.NET - By David McAmis, Wrox Publication
24. Crystal Reports .NET Programming – By Brian Bischof, Bischof Systems

Course Name : PGDCA (Specialization in Web Technology)

Objective :

Enrolled student obtain practical knowledge in Web technology. The student can have good knowledge about developing, designing, hosting and troubleshooting of web applications. The syllabus will cover major web related technologies, database and big-data concepts useful for web applications.

Pre-requisite : Fundamental knowledge of WebPages, websites, HTML and CSS.

Paper-101 : Fundamentals of Web-Design:

Unit-1 :

- Introduction to Web technology (Web page, Website, How to host the site, URL)
- HTML (4.0) Fundamentals : (HTML Editors, Elements, Attributes, Headings,Paragraphs)
- Formatting, Quotations, Comments, Colors, Images, Tables, Lists, Blocks.

Unit-2 :

- HTML (5.0) Comments, Images, Tables, Lists, Blocks, Classes, Id, Iframes, File Paths.
- Styles, Head, Layout, Responsive, Computer code, Entities, Symbols, Charset,
- HTML5 new elements, HTML5 Sementics, HTML5 Migration.
- HTML5 Video, Audio, Plug-ins, Youtube

Unit-3 :

- CSS (Introduction, Syntax, Colors, Background, Borders, Margin, Height/Width)
- CSS (Outline, Text, Fonts, Icons, Links, Lists, Tables, Display, Max-Width, Position)
- HTML5 APIs (Geo-location, Drag/Drop, Web Storage, Web Workders, SSE)
- XHTML fundamentals, need and use.

Unit-4 : Bootstrap 4

- Basics, Typography, Colors, Tables, Images, Jumbotron, Alerts, Buttons, Button Groups.
- Badges, Progress Bars, Spinners, Pagination, List Groups, Cards, Dropdowns, Collapse
- Navs, Navbar, Forms, Input Groups, Custom Froms
- Tooltip, Popover, Toast, Scrollspy, Utilities, Media Objects, Filtres

Paper-102 : Javascript and DOM :

Unit-1 :

- Bootstrap4 Grid (Grid System, Stacked/Horizontal, XSmall, Small, Medium, Large)
- Bootstrap4 basic Templates.
- Java Script(Introduction, Statements, Syntax, Comments, Variables, Operators, Arithmetic)
- Java Script(Assignment, Data Types)

Unit-2 : Java Script:

- Functions, Objects, Events, Strings, String Methods
- Number, Arrays(Methods, Sort, Iteration) , Dates, Date Formats, Date Get/Set methods
- Control Structures (Switch, conditions, Loops, Break)
- Type Conversion, Errors, Hoisting, this, Let, Const

Unit-3 : Java Script Forms:

- JS Forms, Forms API, Methods, Properties, Accessors, Constructors, Prototypes
- JS Functions (definition, Parameters, Invocation, Call, Apply, Clousers)

Unit-4 : DOM

- Introduction, Methods, Document
- Elements, Animations, Events, Event Listener
- Navigation, Nodes, Collections, Node Lists

Paper-103 : PHP 7 & MySQL :

Unit-1 : PHP Fundamentals

- PHP : (Introduction, Install, Syntax, Variables ,Echo/print, Data Types, String, Constants, Operators).
- Conditional Statements, Loops,
- Arrays, Functions, Sorting Arrays, Superglobals.
- Forms: (Handling, validations, Required, URL/Email

Unit-2 : PHP Advanced :

- Arrays Multi, Date and Time, Include
- File Handling (Open, read, create, write, upload,
- Cookies, sessions, Filters, Advanced Filters.

Unit-3 : MySQL Database :

- Creating , Create DB, Create Table, Insert Data, Multiple insertion,
- Select, Update, Delete, Limit Data.

Unit-4 : PHP7 XML and AJAX(Asynchronous JavaScript and XML):

- Introduction of XML
- XML Parsers, Simple XML Parser, SimpleXML Get, Expat, DOM
- AJAX (Introduction, XMLHttp, AJAX Request, Response, AJAX XML File)
- AJAX PHP, AJAX Database

Paper-104 : Project & Technical skills: **[Lab Hours: 20 Hours]**

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-105 : Practical : **[Lab Hours: 180 Hours]**
Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-101 to 103.

Semester- 2:

Paper-201 : JSON and Node.js:

Unit-1 : JSON

- JSON (Introduction, Syntax JSON vs XML)
- JSON (Data types, Parse, Stringify, Objects, Arrays)
- JSON PHP, JSON HTML, JSONP

Unit-2 : Node.js

- Introduction, Modules,
- HTTP Module,
- File System,
- URL Module,
- NPM

Unit-3 :

- Events,
- Upload Files,
- Email

Unit-4 :

- Node.js with MySQL (Create Database, Create table, Insert, select, delete, drop table, where clause, Update, limit, Join).

Paper-202 : MongoDB and Node.js:

Unit-1 : MongoDB :

- Introduction,
- Advantages,
- Data Modeling,
- Create Database,
- Drop Database

Unit-2 : MongoDB Queries :

- Data types,
- Insert, Update, Delete,
- Query, Projection

Unit-3 : MongoDB :

- Limiting Records,
- Sorting Records, Indexing,
- Aggregation, Replication
- Sharing,
- Create Backup, Deployment.

Unit-4 : MongoDB using Node.js :

- Create Database,
- Create Collection,
- Insert, Find, Query, Delete,
- Drop Collection
- Update, Limit, Join.

Paper-203 : MongoDB and AngularJS :

Unit-1 : AngularJS :

- Introduction, Environment setup,
- MVC Architecture, Directives
- Expressions, Controllers,

Unit-2 : AngularJS:

- Filters, Tables, Modules,
- Forms, Includes
- Views, scopes,
- Servies, Dependency Injection,
- Custom Directives.

Unit-3 : AngularJS applications :

- Notepad, Bootstarp,
- Login, Upload File,
- Nav Menu, order

Unit-4: AngularJS and MongoDB:

- Search, Drag , Cart,
- Translate, Chart, Maps,
- Share, Weather, Timer, Leaflet.
- Webservices REST
- SOAP web services
- XML,

Paper-204 : Technical Skill : **[Lab Hours: 20 Hours]**

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-205 : Practical : **[Lab Hours: 180 Hours]**

Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-201 to 203.

Semester-3

301 : Project : [Full Time]

Student will undergo full time project based on the Web Technology / Framework. The nature of Project will be full-Time. Student will report about their progress to internal guide every week.

302: Presentation & Technical Skills: [2 Hours per Week]

Students will undergo two online certification of their choice from the list of certification (MOOC) list. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, the same will be considered for claiming 2 credits for each course.

Student will prepare and present the presentation based on the MOOC course on which the certification and credits are claimed.

Course Name : PGDCA (Specialization in Mobile Application Development) :

Objective :
Enrolled student obtain practical knowledge in Mobile technology. The student can have good knowledge about android and iOS technology using which one can develop mobile apps.

Pre-requisite : Fundamental knowledge of Java Programming.

Semester-1 :

Paper -101 : Fundamentals of Java Programming and Android.

Unit-1 Introduction of programming fundamentals:
- Problem solving
- Primitive data types and arithmetic expressions
- Object-oriented programming basics
- Branching and Loops
- Arrays

Unit- 2 covers the following topics:
- String manipulation
- File I/O
- Simple event-driven programming
- Recursion
- Abstract data types

Unit-3 :
- Multidimensional Arrays, Simple Sorting
- Character String, File I/O
- Simple Event Driven Programming, Recursion
- Abstract Data Type
- Concepts of Exception Handling, try…catch block.
- Types of Exceptions: Uncaught exceptions, Nested try block, Throw clause
- Finally clause
- Difference between : Error and Exception, Checked and Unchecked
- Exceptions, Throw and Throws.
- Basics of Thread, Thread Life cycle, working of Thread.
- Creating Thread using Thread class and Runnable Interface.
- Extending, Stopping and Pausing Threads, Concepts of Daemon Thread.
- Priority of Thread and Thread scheduling
- Parallel execution of Thread in Synchronous and asynchronous mode.

Unit-4 :
- Communication and exchange information
- Communication & Sockets
- EchoClient , EchoServer
- Working with URLS and URL Connection Example
- Data Serialization:
    - Serialization XML & JSON
    - The SAX Parser, SAX Parser Code Example
    - Document Object Model (DOM), DOM Parser Example
    - Java API for Json Processing, Json Processing Example

Paper-102 : Introduction to Android Studio :

Unit - 1
- Android Studio: Introduction, Installing Android Studio
- Android EmulatorJava 8 on Android,
- Java 8 Features and the Jack Compiler
- Android Overview

- Android Basic Blocks
- Basic UI Elements
- Strings.xml & message localization
- Resources and Asset Files
- Gradle Dependencies
- Android Broadcast Intent and Broadcast Receiver
- Debugging
- Working with my App
- Persisting Application State
- Debug Logcat Errors

Unit - 2

- Recyclerview, Adapter & ViewHolder
- Fragments
- Material Design Elements
- Navigation
- Testing with Espresso
- Working with my App
- Adding Views Dynamically
- Building Layouts for screen configuration changes
- Working with Custom Styles & Themes

Unit - 3

- Android Hierarchical Navigation , Webview
- Custom Views
- Permission system
- AsyncTask, Threading and Handlers
- Using AsyncTask vs. Java Threads (with Handlers)
- Loaders
- AsyncTaskLoader & CursorLoader
- Background Services
- Android Scheduling task
- Working with my App
- Access Files in Assets
- Access Resources

Unit-4

- Save Data and Files
- SQLite Databases
- Content Providers
- Loaders
- Background Services
- Widgets
- Notifications
- Getting Ready for Deployment
- Publish on Play Store

Paper-103 : Android App Development :

Unit-1 :

- Android Architecture
- Android Architecture (Implementation)
- About Firebase
- User Interface (UI)
- Libraries
- Working with my App
- Setup Description
- Chat Login
- Contact List
- Add Contact
- Chat

Unit-2 :

- Dart and Henson
- Dependency Injection
- User Interface (UI)
- Working with my App
- Twitter Kit
- TwitterClient Setup, Domain, Libs
- TwitterClient Login, TwitterClient Main, TwitterClient Images
- TwitterClient Hashtags
- Navigation Drawer , Firebase Cloud Messaging

Unit -3

- Libraries, API
- User Interface (UI), Working with my App
- Facebook SDK (Tutorial), FacebookRecipes Setup, Domain, Libs
- FacebookRecipes Login
- Volley, Retrofit 2 and OkHTTP
- FacebookRecipes RecipeMain
- GreenDAO, ORMLite and SugarORM
- FacebookRecipes RecipeList
- Realm,

Unit- 4

- Maps, Camera, Working with my App
- PhotoFeed Setup, Domain, Libs
- Firebase DB Rules, PhotoFeed Login
- PhotoFeed Main Activity
- Open Street Maps (Google maps alternative)
- Take pick photo, Map-Fragment

OUTCOME : (Practical Implementation simultaneously with this Subject.) :

App-1: Building a Basic Chat Application
App-2: Create a Twitter App
App-3: Integrating Facebook with my App: Facebook Recipes
App-4: Your social network of photographs!
App-5: Building a note-taking app for android

Paper-104 : Project & Technical skills: **[Lab Hours: 20 Hours]**

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-105 : Practical : **[Lab Hours: 180 Hours]**

Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-101 to 103.

Semester- 2:

Paper-201 : Monetize Android Applications

Objective : This paper covers how to **monetize Android apps** without adversely affecting the user experience. It will cover the best practices of advertising, monetizing and publishing Android app. It will also present an introduction to business models that will help to make money from an app using Google AdMob, Google's mobile advertising platform specifically designed for mobile apps.

Unit 1: Introducing Monetization

- Why and How to monetize application
- Make a product: solve a problem!
- Successful apps use cases
- App markets and distribution models
- Developing a monetization plan

Unit 2: Business Models

- Monetization Strategies
- Important metrics on monetization
- Optimize your model
- Case Study

Unit 3: Enterprise App Monetization

- Building a strategy
- Pricing and models
- Case Study

Unit 4: Technical implementation on Android

- Analytics and reporting
- Notifications
- Onboarding process
    - Invites
    - Dynamic Links
    - App Indexing
- AdMob Introduction
- Introduction to models to make money from an app and Google AdMob
- Create code to display Banner and Interstitial ads in an app

Paper-202 : DevOps for Mobile Apps and Fundamentals of Swift:

- Unit- 1: Intro to Visual Studio App Center (VSAC)
    - What is Visual Studio App Center (VSAC)
    - Manage Apps
- Manage Organizations
- Building Apps with VSAC
    - Overview
    - Configure a Build
    - Sign a Build
    - Test App on Real Device
- Unit- 2: Testing Apps with VSAC
    - Overview
    - Prepare Tests for Upload
    - Submit Tests
    - Review Test Results
- Unit-3 : Distributing Apps with VSAC
    - Overview
    - Release a Build

- Manage/Distribution Groups
- Install a Build
- Distribute to Stores

- Unit- 4: Intro to Visual Studio App Center (VSAC)

Paper- 203-1 : Mobile App Development using Swift

Objective :

- Understand and use the Swift programming language;
- Use and explain the Apple developer tools: including Xcode, Interface Builder, Documentation Browser; Confidently converse with iOS developers, understanding the basics of coding and App development; Design, develop and build your own simple iOS Apps.

Unit 1: Starting App Development:

- Significance of Swift;
- Concepts of terminal, playgrounds;
- Use of Xcode to build an App for iOS;
- Use and understanding of variables and data types.
- Make decisions within programs using if-then-else statements;
- Use of different logical operators NOT, AND and OR to verify the truth of something;
- Use of switch statement to control what is executed next; and
- Use of arrays and dictionaries to store data.
- Xcode and Interface Builder:
- Navigate through Xcode projects;

Use of following areas of Xcode: project navigator, the debug area, the assistant and version editors;

Use interface builder to build interfaces and be able to preview interfaces outside of a running App.

Unit – 2: Functions, Classes and Structures:

Understand the benefits of abstraction when writing code;

- Create functions, classes and structures to improve program quality;
- Use classes and structures to create custom datatypes;
- Understand relationships and inheritance between classes.
- Build Apps using common user interface views and controls;
- Use Interface Builder to configure common user interface views and controls;
- Connect Swift code to common user interface controls;
- Use Auto Layout to ensure Apps adapt to different devices.

Unit 3: View Controllers and Navigation:

Develop Apps with multiple scenes;

- Use tab bar controllers to move between scenes within Apps.
- Create and utilize event handlers on view controllers;
- Design an appropriate navigation hierarchy for your app.
- Use the Model View Controller design pattern for App development;
- Use a ScrollView to control content display;
- Use tables to display data within your App;
- Respond to user input within a table.

Unit-4 :

ScrollViews , Gesture Recognizers

Handling Touches, Segues, Navigation Controllers, Tab Bar Controllers

Persistence & Networking:

Module Introduction , NSUserDefaults,

NSURLSession, NSKeyedArchiver, CoreData

Paper-203-2 : Work with augmented reality (AR) and the web

Objective :

To learn how to build AR apps with Xcode and look at the different ways to integrate web content into your iOS apps.

Unit-1 : User interaction and how to save data :

- Write and access files within Apps
- Serialize a data model for saving and loading data from and into Apps
- Customise tables for adding, deleting and customizing actions;
- Create custom row actions.

Unit-2 : User input and system controls in Apps:

- Displaying alerts, sharing content and sending messages from within Apps;
- Access to the camera and photo library on the device;
- Build custom forms for creating new object models;
- Get complex user input through forms, data collection and dynamic table views.
- Learn how to use the AR app template;
- Investigate AR components and compare their differences with existing components;
- Build AR scenes in 3D space using objects;
- Determine planes and how objects interact with them.

Unit-3 : Interact with an AR App

- Add physics to an AR scene;
- Translation of user input within the scene;
- Introduction to AR Image Recognition.
- Closures and Animation
- Define and use closures;
- Use defined functions: sort, filter, reduce and map;
- Utilise animation for a greater user experience;
- Use UIKit to create animations.

Unit-4 : Communicate with the Web

- Describe requests and responses, and discover how are they built, used and analysed;
- Communicate with API's for existing data sources;
- Use URL components to dynamically query an API endpoint.
- Decode JSON and convert into Swift types;
- Integrate with requests and responses from API's.
- Concurrency and its significance.
- Issues with multi-threading and the UI;
- How to complete tasks asynchronously.

Paper-204 : Technical Skill : **[Lab Hours: 20 Hours]**

In-house Lab. Task (Project) will be assigned which will be submitted by the student. On verification and approval by the faculty, The same will be produced for claiming 2 credits.
Students will undergo online certification from the list of certification (MOOC) listed. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, The same will be produced for claiming 2 credits.

Paper-205 : Practical : **[Lab Hours: 180 Hours]**
Every day 3 hours of Practical Lab. Work in lab: As per schedule shown for Paper-201 to 203.

Semester-3

301 : Project : [Full Time]

Student will undergo full time project based on the Web Technology / Framework. The nature of Project will be full-Time. Student will report about their progress to internal guide every week.

302: Presentation & Technical Skills: [2 Hours per Week]

Students will undergo two online certification of their choice from the list of certification (MOOC) list. They have to produce the certificate to acquire the credit before examination to their concerned faculty. On verification and approval by the faculty, the same will be considered for claiming 2 credits for each course.

Student will prepare and present the presentation based on the MOOC course on which the certification and credits are claimed.

Reference Books :

PGDCA (Specialization in Mobile Application Development)

1. Core Java Volume 1 – Fundamentals, Eleventh Edition, By Cay S. Horstmann
   Publisher: Prentice Hall, ISBN :9780135167199
2. Core Java Volume 2 – Advance Feature, Ninth Edition, By Cay S. Horstmann
   Publisher: Prentice Hall, ISBN: 9780135167175
3. Android Application Development (with Kitkat Support) Black Book
   By Pradeep Kothari, Publisher: Dreamtech Press, ISBN : 9789351194095
4. Professional Android, Fourth Edition, By Reto Meier and Lan Lake
   Publisher: John Wiley & Sons, Inc., ISBN : 978-1-118-10227-5
5. Expert Android Programming, By Prajyot Mainkar
   Publisher : Packt Publishing, ISBN : 978186468956
6. Mobile App Marketing and Monetization, By Alex Genadinik,
   Create space Independent Pub, ISBN : 9781502383822
7. Mastering swift 4 – Fourth Edition, By Jon Hoffman
   ISBN : 9781788477802
8. Augmented reality for android application development, By Jens Grubert and Dr. Raphael Grasset, Publisher : Packt Publishing Ltd, ISBN : 9781782168553
9. Head first android development, 2nd edition, By Dawn Griffiths and David Griffiths
   Publisher : O'Reilly, ISBN : 9781491974056
10. Android Programming Unleashed, By B. M. Harwani
    Publisher : SAMS, ISBN : 9780672336287
11. Android studio 3.3 Development essentials, By Neil Smyth, Publisher : Independently published (February 5, 2019), ISBN : 9781795654760
12. Android programming by beginners , 2nd edition By John Horton, Publisher Packt
    ISBN : 9781789531039

PGDCA (Database and database administration)

1. Python the complete reference (English, Paperback, Martin C. Brown), Publisher: McGraw Hill, ISBN: 9789387572942, 9387572943
2. Python Programming - Using Problem Solving Approach First Edition, Binding: Paperback, Publisher: Oxford University Press, ISBN: 9780199480173, 0199480176
3. SQL, PL/SQL the Programming Language of Oracle Paperback, by Ivan Bayross (Author), ISBN 10: 8176560723 ISBN 13: 9788176560726, Publisher: BPB Publications, 2003
4. Fundamentals of Database System by Elmasri Ramez (Author), Navathe Shamkant (Author), Publisher Pearson, ISBN : 9788131792476
5. Data base management system By Raghu Ramakrishnan and Johannes Gehrke, Publisher: McGraw Hill Education; Third edition, ISBN: 978-9339213114
6. Database Systems: Concepts, Design and Applications, by S. K. Singh, Publisher: Pearson India, ISBN: 9788177585674
7. Database Systems: Models,Languages,Design and Application Programming, 6e by Elmasri, Publisher: Pearson Education India; 6 edition (2013), ISBN: 978-8131792476
8. Oracle Database 12c PL/SQL Programming, by McLaughlin (Author), Oracle Press, ISBN : 9780071812436
9. Oracle PL/SQL Performance Tuning Tips & Techniques, by Paul Dorsey, Michael Rosenblum, Publisher: Oracle Press, ISBN: 9780071824828
10. ORACLE PL/SQL PERFORMANCE TUNING TIPS, by Michael Rosenblum And Paul Dorsey, Oracle Press, ISBN : 9780071824828
11. Data base security by Alfred Basta and Melissa Zgola, ISBN : 9781435453906
12. Advanced RDBMS Using Oracle, By Himanshu Dabir and Dipali Meher, Publisher: Vision Publications; Second edition, ISBN-13: 978-9350161500

Reference book list for P.G. D.C.A. (web design) :

1. Advanced HTML companion – Keith S. & Roberts - AP Professional, ISBN no - 13 : 9780126235425

2. HTML & CSS: The Complete Reference fifth edition- Thomas Powell - McGraw Hill Education , ISBN: 978-0-07-174170-5

3. HTML Unleased, Darnell Rick – Techmedia , ISBN-13: 978-0672313479

4. Step By Step HTML 5.0 , Faithe Wempen, Microsoft & O'Reilly Media, ISBN No: 978-0-735-64526-4

5. HTML, XHTML, and CSS Bible - Steven M. Schafe - Wiley Publications , ISBN: 978-0-470-52396-4

6. Cascading Style Sheets- The Definitive Guide, E. A Meyer – O'Reilly, ISBN 1-56592-622-6

7. Java Scripting Programming for Absolute Beginner, Harris - PHI , ISBN-13: 978-0761534105

8. JavaScriptStep by Step 2nd edition, Steve Suehring – PHI, ISBN 13: 978- 120344426

9. Bootstrap in 24 Hours, Sams Teach Yourself - Jennifer Kyrnin , ISBN-13: 978-0672337048

10. Learning Bootstrap 4 - Matt Lambert - Packt Publishing , ISBN NO: 978-1-78588-100-8

11. Bootstrap Responsive Web Development - Jake Spurlock - O'Reilly Media. ISBN No: 978-1-449-34391-0

12. Learning jQuery , Jonathan Chaffer, Karl Swedberg- Packt publication, ISBN-13: 978-1782163152

13. JQuery For Dummies, Lynn Beighley - Wiley Publications., ISBN-13: 978-0470584453

14. Beginning Jquery , Jack Franklin, Apress, ISBN-13: 978-1430249320

15. Ajax For Dummies, Steve Holzner, Wiley Publishing, ISBN-13: 978-0-471-78597-2

16. Ajax Programming for the Absolute Beginner, Jerry Lee Ford, Jr., Course Technology, ISBN-13: 978-1-59863-564-5

17. ANGULARJS: Easy AngularJS For Beginners, Your Step-By-Step Guide to AngularJS Web Application Development, Felix Alvaro, CreateSpace Independent Publishing Platform, ISBN-10: 1534639403

18. MongoDB Basics , David Hows, Peter Membrey & Eelco Plugge, Apress, ISBN-13: 978-1484208960

19. Data Modeling for MongoDB: Building Well-Designed and Supportable MongoDB Databases, by Steve Hoberman, Technics Publications, ISBN-13: 978-1935504702

20. NoSQL with MongoDB in 24 Hours, Sams Teach Yourself, by Brad Dayley , Sams Publishing, ISBN-13: 978-0672337130

21. Learning XML, Erik T. Ray, O'Reilly Media, ISBN: 0596000464

Reference Books for PGDCA (.NET technology):

1. Visual Basic .NET Programming (Black Book) - By Steven Son Holzner, DreamTech Publication, ISBN : 978-8177226096
2. Mastering Visual Basic.NET - By Evangelos Petroutsos, BPB Publication, ISBN : 978-0782128772
3. Moving to VB.NET : Stategies, Concepts, and Code - By Dan Appleman, Apress Publication, ISBN : 978-1590591024
4. Microsoft Visual Basic .NET Step by Step - By Michael Halvorson, PHI Publication, ISBN : 978-8448132279
5. Database Programming with Visual Basic.NET and ADO.NET – By F.Scott Barker, Sams Publication, ISBN : 978-0672322471
6. Beginning .NET Web Services Using Visual Basic .NET - By Joe Bustos and Karlli Waston, Wrox Publication, ISBN : 978-1861007254
7. .NET – Complete Development Cycle - By G. Lenz, T. Moeller, Pearson Education, ISBN : 978-0321168825
8. Professional VB.NET, 2nd Edition - By Fred Barwell, et al, Wrox Publication, ISBN-: 978-0764544002
9. Teaching Methodology ASP.NET – A Beginner's Guide - By Dave Mercer, TMH, ISBN: 978-0764544002
10. ASP.NET Bible – By Mridula Parihar et. Al., Wiley India, ISBN : 978-0764548161
11. Programming ASP.NET 4 – By Dino Esposito, Microsoft Press, ISBN : 978-0735643383
12. Professional ADO.NET – By Bipin Joshi, Donny Mack, Doug Seven,Fabio Claudio Ferracchiati, Jan D Narkiewiez, Wrox Publication, ISBN : 978-1861005274
13. ASP.NET for Developers – By Amundsen, SAMS, ISBN : 978-0672320385
14. The Complete Reference ASP.NET – By Matthew MacDonald –TMH, ISBN : 978-0070495364
15. ASP.NET – Black Book – DreamTech, ISBN : 978-8177224559
16. Beginning ASP.NET 3.5 in C# and VB – By Imar Spaanjaars ,Wrox, ISBN : 978-0470502211
17. Professional ASP.NET 3.5 AJAX - By Bill Evjen, Dan Wahlin, David Reed, and Matt Gibbs, Wrox Publication, ISBN : 978-0470392171

18. Ajax: The Complete Reference 1st Edition - By Thomas A. Powell, Osborne Publication, ISBN : 978-0071492164

19. Programming Microsoft LINQ in .NET Framework 4 - By Paolo Pialorsi, Marco Russo, Microsoft Press, ISBN : 978-0735624009

20. Pro ASP.NET MVC 5 - By Adam Freeman, APress Publication, ISBN : 978-1430265290

21. Essential Angular for ASP.NET Core MVC - By Adam Freeman, Apress Publication, ISBN : 978-1484229156

22. Professional Crystal Reports for VS.NET - By David McAmis, Wrox Publication, ISBN : 978-0764557309

23. Crystal Reports .NET Programming – By Brian Bischof, Bischof Systems, ISBN : 978-0974953656

Reference Books for P.G.D.C.A.(Java Technology):

1. Java - The Complete Reference – Herbert Schildt, McGraw Hill Education, ISBN : 9781260440249
2. Java Programming Language – Ken Arnold, James Gosling, Addison-Wesley Pub, ISBN 10: 0201634554 ISBN 13: 9780201634556
3. Java 2 From Scratch – Steven Haines, PHI, ISBN : 9780789721730
4. Programming in Java – E-Balaguruswamy, Tata McGraw Hill, ISBN- 13: 978-9351343202 ISBN-10: 9789351343202
5. Java : How to Program – Paul Deitel & Harvey Deitel, PHI, ISBN-13: 978-0136053064 ISBN-10: 0136053068
6. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud – George Reese, enguin Books Ltd, ISBN-10: 8184047142 ISBN-13: 978-8184047141
7. Starting Struts 2 – Ian Roughley, InfoQ, ISBN : 9781430320333
8. More Servlets and JavaServer Pages – Marty Hall, Pearson Education, ISBN : 9780130676146
9. Struts 2 Black Book – Kogent Solutions Inc., Dreamtech Press, ISBN : 9788177228700
10. Professional JavaScript for Web Developers - Nicholas C. Zakas , WROX, ISBN: 978-0-7645-7908-0
11. Beginning jQuery - Franklin**,** Jack, Apress, *ISBN* : 978-1-4302-4933-7
12. JSON Quick Syntax Reference -Wallace Jackson , Apress, ISBN-13: 978-1484218624 ISBN-10: 1484218620
13. JSON Book: Easy Learning of JavaScript Standard Object Notation Paperback – Steven Keller , CreateSpace Independent Publishing Platform, ISBN-10: 154122812X ISBN-13: 978-1541228122
14. Professional Hibernate - Eric Pugh, Joseph D. Gradecki , WROX, ISBN-13: 978-0764576775 ISBN-10: 0764576771
15. Beginning Hibernate: For Hibernate 5 - Joseph B. Ottinger, Jeff Linwood, Dave Minter, Apress ISBN-13: 978-1484223185 ISBN-10: 1484223187
16. Introducing Spring Framework: A Primer 1st ed. Edition - Felipe Gutierrez , Apress, ISBN-13: 978-1430265320 ISBN-10: 1430265329
17. Professional Java Development with the Spring Framework 1st Edition – Rod Johnson (Author), J?rgen H?ller (Author), Alef Arendsen (Author), Thomas Risberg (Author), Colin Sampaleanu (Author) , WROX, ISBN-13: 978-0764574832 ISBN-10: 0764574833