

## 15. INFORMATICS PRACTICES (CODE: 065)

### Learning Objectives:

- To gain working knowledge of a computer system including peripherals
- To understand the application development process.
- To gain programming skills in front-end development
- To gain skills in back-end development: Relational Database Creation and Management.

### Competencies Developed:

- Sound knowledge of computer system
- Familiarity with application development process using simple IDEs
- Ability to use, develop and debug programs independently.
- Ability to store and retrieve data using an RDBMS.

### COURSE DESIGN CLASS-XI (2013-14)

Unit	Topic	Periods			Marks
		Theory	Practical	Total	
1.	Introduction to Computer Systems	20	08	28	10
2.	Introduction to Programming	45	42	87	25
3.	Relation Database Management System	50	45	95	30
4.	IT Applications	10	20	30	05
		125	115	240	70

### Unit 1: Introduction to Computer Systems

**10 Marks (20 Theory + 8 Practical) Periods**

#### Hardware Concepts:

- Computer organization (basic concepts): CPU, Memory (RAM and ROM), I/O devices, communication bus, ports (serial, parallel), device specific ports;
- Input devices: Keyboard, Mouse, Light pen, Touch screen, Graphics Tablet, Joystick, Microphone, OCR, Scanner, Smart Card reader, Barcode reader, Biometric sensor, Web camera;
- Output Devices: Monitor/Visual Display Unit (VDU), LCD screen, Television, Printer (Dot Matrix Printer, Deskjet/ Inkjet/ Bubble jet Printer, Laser Printer), Plotter, Speaker;
- Secondary Storage Devices: Floppy disk, Hard disk, Compact disk, Magnetic tape, Digital Versatile disk (DVD), Flash drive, Memory cards. Comparative properties of storage media;
- Memory Units: bit, byte (Kilobyte, Megabyte, Gigabyte, Terabyte, Petabyte)
- E-waste disposal.

#### Security of computer system

Sources of attack and possible damages, malware - virus, worms, trojan, spyware- and their propagation,

cookies as security threat, malware detection using a tool. Computer security, Digital certificate, Digital signature, firewall, password, file access permissions

### **Types of Software:**

- a) System Software:
  - (i) Operating systems: Need for operating system, major functions of Operating System; Examples of OS for mainframe, PC/Server, and mobile devices.
  - (ii) Language Processors: Assembler, Interpreter, and Compiler
- b) Utility Software: Compression tools, disk defragmenter, anti-virus.
- c) Application Software:
  - (i) General Purpose Application Software: Word Processor, Presentation Tool, Spreadsheet Package, Database Management System, Integrated Development Environment (IDE)
  - (ii) Specific Purpose Application software: Inventory Management System, Purchasing System, Human Resource Management System, Payroll System, Financial Accounting, Hotel Management and Reservation System, etc.

## **Unit 2: Introduction to Programming 25 Marks (45 Theory + 42 Practical) Periods**

### **Getting started with Programming using IDE**

- Introduction, Rapid Application Development using IDE (Integrated Development Environment); Familiarization of IDE using basic Interface components- Label, Text Field, Text Area, Button, Checkbox, Radio Button. (As per appendix A)
- Developing General Application (As per the guidelines at appendix B) - Getting Familiar with Java Swing User Interface components-Frame, Dialog, Option Pane, Panel, Scroll Pane, Label, Text Field, Password Field, Text area, Button, Check Box, Radio Button, Combo Box, List.
- Basic component handling methods and properties: `setText()`, `getText()`, `isSelected()`, `setSelected()`.

### **Programming Fundamentals**

- Data Types: Concept of data types; Built-in data types - byte, short, int, long, float, double, char, String, boolean
- Variables: Need to use variable, declaring variables, variable naming convention, assigning value to variables;
- Integer object method: `parseInt`
- Double object method: `parseDouble`, `parseFloat`
- Control structures:
  - Decision structure - if, if-else, switch;
  - Looping structure- while, do . . while, for;

### **Programming Guidelines:**

- General concepts; modular approach;
- Stylistic guidelines: clarity and simplicity of expressions and names; comments, indentation;
- Running and debugging programs, syntax errors, run-time errors, logical errors;
- Problem solving methodology: Understanding of the problem, Identifying minimum number of inputs required for output, breaking down problem into simple logical steps.

## Unit 3: Relational Database Management System

30 Marks (50 Theory + 45 Practical) Periods

### Database Management System

- Introduction to database concepts: database, relational database, relation/table, attribute/field, tuple / row;
- Data types: Text (CHAR, VARCHAR), Number (DECIMAL, INT/INTEGER), Date and Time
- Keys: candidate key, primary key, alternate key, foreign key;
- Examples of common Database Management System:MySQL, Ingres, Postgres, Oracle, DB2, MS SQL, Sybase, etc.; Common Database management tools for mobile devices.

### Introduction to MySQL

(ANSI SQL 99 standard commands)

- Classification of SQL Commands:  
DML - SELECT, INSERT, UPDATE, DELETE  
DDL - CREATE, DROP, ALTER
- Creating and using a database: SQL CREATE command to create a database, USE command to select a database.
- Creating a table: CREATE command to create a table, DESC command to display a table structure, INSERT command for inserting new rows, inserting new rows with null values and values of all the studied data types.
- Displaying table data: SELECT command for selecting all the columns, selecting specific column(s) using arithmetic operators, operator precedence.
- Defining and using column alias.
- Eliminating duplicate values from display using DISTINCT keyword
- Limiting rows during selection (using WHERE clause)
  - Using comparison operators - =, <, >, <=, >=, <>, BETWEEN, IN, LIKE(%,\_);
  - Logical operators -AND, OR, NOT and corresponding operator precedence;
- Working with NULL values.
- ORDER BY clause: Sorting in ascending/descending order, sorting by column alias name, sorting on multiple columns;
- Manipulating data of a table/relation: update command to change existing data of a table, delete command for removing row(s) from a table.
- Restructuring a table: ALTER TABLE for adding new column(s) and deleting column (s);

### Functions in My SQL:

- String Functions: ASCII(), CHAR(), CONCAT(), INSTR(), LCASE(), UCASE(), LEFT(), LOWER(), LENGTH(), LTRIM(), MID(), RIGHT(), RTRIM(), SUBSTR(), TRIM(), UPPER(), ASCII()
- Mathematical Functions: - POWER(), ROUND(), TRUNCATE().
- Date and Time Functions: CURDATE(), DATE(), MONTH(), YEAR(), DAYNAME(), DAYOFMONTH(), DAYOFWEEK(), DAYOFYEAR(), NOW(), SYSDATE().

## Unit 4: IT Applications

5 Marks (10 Theory + 20 Practical) Periods

- e-Governance: Definition, benefits to citizens, e-Governance websites and their salient features and societal impacts; e-Governance challenges.
- e-Business: Definition, benefits to customers and business, e-Business websites and their salient features and societal impacts; e-Business challenges.
- e-Learning: - Definition; benefits to students (learners), teachers (trainers) and school (institution) management; e-Learning websites and their salient features and societal impacts; e-Learning challenges.

In each of the above domains, identify at least two real-life problems, list the input(s) required for the expected output(s), and describe the problem solving approach.

Impact of ICT on society - social and economic benefits, infomania.

### CLASS XI (PRACTICAL) (2013-14)

S.No	Description	Marks
1	Problem Solving using Java	12
2	SQL Queries	4
3	Practical Records: <ul style="list-style-type: none"><li>● Productivity Tools</li><li>● Simple Problems using Java</li><li>● SQL Queries</li><li>● IT Applications</li></ul>	10
4	Viva Voce	4
	<b>Total</b>	<b>30</b>

### Evaluation of Practical Examination

#### 1. Problem Solving using Java

Student is required to solve programming problems based on all concepts covered in theory throughout the year and maintain a record of these in the practical file. Student will be given a problem to be solved using Java during final practical examination to be conducted at the end of the academic session.

#### 2. SQL Queries

Students will be trying out SQL queries in MySQL throughout the year along with course coverage in theory. Student will be asked to write 4 queries based on one or two tables during final practical examination to be conducted at the end of the academic session.

#### 3. Practical Record File

A practical record file is required to be created during the entire academic session. It should be duly signed by the concerned teacher on regular basis and is to be produced at the time of Final Practical Examination for evaluation. It should include the following:

- At least 10 solutions of simple problems using IDE based Java (refer to Appendices 'A' & 'B').
- At least 3 IT applications - problem-solving framework.
- At least 20 SQL queries on any database.

#### 4. Viva Voce

Students will be asked oral questions during practical examination to be conducted at the end of the course. The questions will be from the entire course covered in the academic session. Out of 6 marks, 2 marks are allotted to test student's understanding of basic computer hardware and their functions.

### Question Paper Design Class - XI (2013-14) and XII (2014-15)

Time: 3 Hours

Marks: 70

S.No.	Typology of Questions	Very Short Answer (VSA) (1 Mark)	Short Answer-I (SA-I) (2 Marks)	Short Answer-II (SA-II) (4 Marks)	Long Answer (LA) (6 Marks)	Total Marks	% Weightage
01.	Knowledge Based	4	3	2		18	26
02.	Conceptual Understanding	4	5	1		18	26
03.	Reasoning Based	4		2	1	18	26
05.	Skill Based		1	2	1	16	22
	<b>Total Marks</b>	<b>12</b>	<b>9</b>	<b>7</b>	<b>2</b>	<b>70</b>	<b>100%</b>

1. No chapter wise weightage. Care to be taken to cover all the chapters.
2. The above template is only a sample. Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.

**COURSE DESIGN**  
**CLASS XII (2014-15) (THEORY)**

Unit	Topic	Period		Total Periods
		Theory	Practical	
1.	Networking and Open Standards	20	4	24
2.	Programming	46	44	90
3.	Relational Database Management System	50	40	90
4.	It Applications	10	26	36
		126	114	240

**Unit 1: Networking and Open Standards**

**10 Marks (20 Theory + 4 Practical) Periods**

**Computer Networking:**

- Networking: a brief overview;
- Communication Media: Wired Technologies - Co-Axial, Ethernet Cable, Optical Fiber; Wireless Technologies - Blue Tooth, Infrared, Microwave, Radio Link, Satellite Link;
- Network Devices: Hub, Switch, Repeater, Gateway - and their functions;
- Types of network: LAN, MAN, WAN, PAN;
- Network Topologies: Star, Bus, Tree;
- Network Protocols: HTTP, TCP/IP, PPP;
- Identifying computers and users over a network: Basic concept of domain name, MAC (Media Access Control), and IP Address, domain name resolution;
- Network security: denial of service, intrusion problems, snooping;
- Internet Applications: SMS, Voice Mail, Electronic Mail, Chat, Video Conferencing;
- Wireless/Mobile Communication: GSM, CDMA, WLL, 3G, 4G;
- Network Security Concepts: Cyber Law, Firewall, Cookies, Hackers and Crackers.

**Open Source Concepts:**

- Open Source Software (OSS), common FOSS/FLOSS examples (e.g., GNU/Linux, Firefox, OpenOffice, Java, Netbeans, MySQL), common open standards (WWW, HTML, XML, ODF, TCP, IP).
- Indian Language Computing: character encoding, UNICODE, different types of fonts (open type vs true type, static vs dynamic), Entering Indian Language Text - phonetic and key map based.

**Unit 2: Programming**

**25 Marks (46 Theory + 44 Practical) Periods**

**Review of Class XI;**

**Programming Fundamentals**

(Refer to Appendix A for Swing Control Methods & Properties, and Appendix B for sample guidelines of GUI Programming)

- Basic concept of Access specifier for class members (data members and methods).
- Basic concept of Inheritance.
- Commonly used libraries:
  - String class and methods: toString(), concat(), length(), toLowerCase(), toUpperCase(), trim(), substring()
  - Math class methods: pow(), round()
- Accessing MySQL database using ODBC/JDBC to connect with database.
- Web application development: URL, Web Server, Communicating with the web server, concept of Client and Server Side.
- HTML based web pages covering basic tags - HTML, TITLE, BODY, H1..H6, Paragraph (P), Line Break (BR), Section Separator (HR), FONT, TABLE, LIST (UL, OL), FORM.
- Creating and accessing static pages using HTML and introduction to XML.

### Unit 3: Relational Database Management System

30 Marks (50 Theory+ 40 Practical) Periods

#### Review of RDBMS from Class XI

##### Database Fundamentals

- Concept of Database Transaction, Committing and revoking a Transaction using COMMIT and ROLLBACK.
- Grouping Records: GROUP BY, Group functions - MAX(), MIN(), AVG(), SUM(), COUNT(); using COUNT(\*), DISTINCT clause with COUNT; Group Functions and Null Values.
- Displaying Data From Multiple Tables: Cartesian product, Union, concept of Foreign Key, Equi-Join
- Creating a Table with PRIMARY KEY and NOT NULL constraints, Viewing Constraints, Viewing the Columns Associated with Constraints using DESC command.
- ALTER TABLE for
  - deleting column(s), modifying data type(s) of column(s),
  - adding a constraint, enabling constraints, dropping constraints.
- DROP Table for deleting a table

### Unit 4: IT Applications

05 Marks (10 Theory+ 26 Practical) Periods

- Front-end Interface: Introduction; content and features; identifying and using appropriate component (Text Box, Radio Button, CheckBox, List, etc., as learnt in Unit 2 (Programming)) for data entry, validation and display.
- Back-end Database: Introduction and its purpose, exploring the requirement of tables and its essential attributes.
- Front-End and Database Connectivity: Introduction, requirement and benefits.
- Demonstration and development of appropriate Front-end interface and Back-end Database for e-Governance, e-Business and e-Learning applications.
- Impact of ICT on society: Social and Economic benefits.

In each of the above domains, identify at least two real-life problems, list the expected outputs and the input(s) required for the output, and describe the problem solving approach and develop relevant front-end interface and back-end database.

**COURSE DESIGN**  
**CLASS-XII: (PRACTICAL) (2014 – 15)**

S.No	Description	Marks
1	Problem solving using Java	10
2	SQL queries	4
3	Practical Records: <ul style="list-style-type: none"> <li>● Simple problems using IDE Java</li> <li>● SQL Queries</li> <li>● IT Applications</li> </ul>	5
4	Project Work	5
5	Viva Voce	6
<b>Total:</b>		<b>30</b>

**Evaluation of Practical Examination**

**1. Problem Solving using Java**

Student is required to solve programming problems based on all concepts covered in theory throughout the year and maintain a record of these in the practical file.

Student will be given a problem to be solved using Java during final practical examination to be conducted at the end of the academic session.

**2. SQL Queries**

Students will be practicing SQL queries in MySQL throughout the year alongwith course coverage in theory.

Student will be asked to write 4 queries based on one or two tables during final practical examination to be conducted at the end of the academic session.

**3. Practical Record File**

A practical record file is required to be created during the entire academic session. It should be duly signed by the concerned teacher on regular basis and is to be produced at the time of Final Practical Examination for evaluation. It should include the following:

- At least 12 solutions of simple problems using IDE based Java (refer to Appendices 'A' & 'B').
- Solution of at least 2 simple problems incorporating Java Application & Database connectivity.
- At least 24 SQL queries based on one and/or two tables .
- At least two web pages using HTML.

**4. Project File**

Students in group of 2-3 are required to work collaboratively to develop a project using Programming and Database skills learnt during the course. The project should be an application in any one of the domains - e-Governance, e-Business and e-Learning - with GUI front-end and corresponding database at the back-end.

**5. Viva Voce**

Students will be asked oral questions during practical examination to be conducted at the end of the course. The questions will be from the entire course covered in the academic session.



## APPENDIX 'A'

### Swing Control Methods & Properties

<b>Class:</b>	Jbutton
<b>Swing Control:</b>	jButton
<b>Methods:</b>	getText(), setText()
<b>Properties:</b>	Background, Enabled, Font, Foreground, Text, Label
<b>Class:</b>	Jlabel
<b>Swing Control:</b>	jLabel
<b>Methods:</b>	getText(), setText()
<b>Properties:</b>	Background, Enabled, Font, Foreground, Text
<b>Class:</b>	JtextField
<b>Swing Control:</b>	jTextField
<b>Methods:</b>	getText(), isEditable(), isEnabled(), setText()
<b>Properties:</b>	Background, Editable, Enabled, Font, Foreground, Text
<b>Class:</b>	Jradio Button
<b>Swing Control:</b>	jRadio Button
<b>Methods:</b>	getText(), setText(), isSelected(), setSelected()
<b>Properties:</b>	Background, Button Group, Enabled, Font, Foreground, Label, Selected, Text
<b>Class:</b>	JcheckBox
<b>Swing Control:</b>	jCheckBox
<b>Methods:</b>	getText(), setText(), isSelected(), setSelected()
<b>Properties:</b>	Button Group, Font, Foreground, Label, Selected, Text
<b>Class:</b>	Button Group
<b>Swing Control:</b>	jButtonGroup
<b>Methods:</b>	
<b>Properties:</b>	Add
<b>Class:</b>	JcomboBox
<b>Swing Control:</b>	jComboBox
<b>Methods:</b>	getSelectedItem(), getSelectedIndex(), setModel()
<b>Properties:</b>	Background, ButtonGroup, Editable, Enabled, Font, Foreground, Model, SelectedIndex, SelectedItem, Text
<b>Class:</b>	Jlist
<b>Swing Control:</b>	jList
<b>Methods:</b>	getSelectedValue()
<b>Properties:</b>	Background, Button Group, Editable, Enabled, Font, Foreground, Model, Selected Index, Selected Item, Text
<b>Class:</b>	Jtable
<b>Swing Control:</b>	jTable
<b>Methods:</b>	addRow(), getModel()

<b>Properties:</b>	model
<b>Class:</b> <b>Swing Control:</b> <b>Methods:</b> <b>Properties:</b>	JOptionPane  showMessageDialog()
<b>Class:</b> <b>Swing Control:</b> <b>Methods:</b> <b>Properties:</b>	DefaultTableModel  getRowCount(), removeRow(), addRow()

### Commonly used Methods

Class	Methods
Integer	parseInt(), toDouble(), toString()
String	concat(), length(), substring(), toDouble(), toLowerCase(), toUpperCase(), trim()
Double	parseDouble(), toString(), toInt()
Math	pow(), round()

### Database Connectivity Methods

Class	Methods
Connection	createStatement(), close()
DriverManager	getConnection()
Statement	executeQuery()
ResultSet	next(), first(), last(), getString()
Exception	getMessage()
System	exit()

**Note:** The visual properties of any of the elements and Data connectivity methods (the properties/methods, which are not highlighted in the above tables) will not be tested in the Theory examination but may be used by the student in the Practicals and Projects.

## APPENDIX 'B'

### Sample Guidelines for GUI Programming

1. To display a message using Label, TextBox, MessageDialog using simple GUI applications.
2. To concatenate two text entries and display using simple GUI application.
3. To perform a simple arithmetic operation (+,-,\*,/) and display the result in MessageDialog or TextBox using simple GUI application.
4. To perform simple arithmetic operation (+,-,\*,/) and display the result in TextBox using simple GUI application.
5. To make simple decision making (if statement) solution and display relevant message using GUI application (Example - Problems related to Eligibility for a given value of Age, "Profit" or "Loss" messages for given values of Cost Price and Sale Price, Grade Display for given values of Marks of students, etc.).
6. To create a simple GUI application to perform both arithmetic and logical operation together (Example - Total, Average and Grade calculation for given marks, Salary Calculation on different criteria).
7. To create a simple GUI application to perform an operation based on the criteria input by the user in a CheckBox or a Radio Button.

**(Example 1:** Find the Discount of an item on the basis of Category of item [Electrical Appliance/Electronic Gadget/Stationary specified using a Radio button] and its Cost [Below 1000/Above 1000/Equal to 1000 specified using a Radio button]).

**(Example 2:** Calculate the incentive of a Sales Person on the basis of his Sales Amount, Customer Feedback, Count of Customer specified using CheckBox)

8. To create a simple GUI application to change the property of a swing element based on the selection made by the user.

**(Example 1:** To change the background or Foreground color of any of the Swing elements of the form based on the color selected from a list.)

**(Example 2:** To change the foreground and background color of a label based on the values input/stored in a combo box.)

9. To create a simple GUI application for repeatedly doing a task based on the user input.

**(Example:** To display the multiplication table of a number input by the user.)

10. To store the data (Admission No., Name, Date of Birth, Class and Section) of 10 students in a table [Table] and find total number of students in each class and section.

### Sample Guidelines for Connectivity Problems

11. To create a simple GUI application that counts and displays the number of records present in a database table.
12. To create a simple GUI application that displays the records of a database table in a tabular format (using jTable) on the GUI form.
13. To create a simple GUI application that displays the records of a database table in a tabular format (using jTable) on the GUI form based on a criteria input by the user.

14. To create a simple GUI application to perform a calculation based on a value retrieved from database table and a value entered by the user in a GUI application.

### **Know More (beyond syllabus):**

Teachers may also motivate students to search for topics of emerging ICT technologies such as Web Services, Cloud Computing, SDK on Android, etc., for group discussions and presentations.

## **REFERENCE**

### **Suggested Reference Books**

#### **Introduction to Computer System**

1. Rajaraman, FUNDAMENTALS OF COMPUTERS 4th Edition, Prentice Hall of India.
2. Peter Norton, INTRODUCTION TO COMPUTER 4th Edition, Tata McGraw Hill

#### **Introduction to Programming**

1. Heiko Böck The Definitive Guide to the NetBeans Platform 6.5, Apress

#### **Relational Database Management System and SQL**

1. Lerry Ulman, MYSQL Database, Pearson Education, 2008

#### **Computer Network**

1. A.S. Tanenbaum, Computer Network 4th Edition, Prentice Hall of India P. Ltd.
2. Williams Stalling, Data Communication and Networks 5th Edition, Prentice Hall of India P. Ltd.

#### **Suggested online tutorials**

1. MySQL - [http://dev.mysql.com/usingmysql/get\\_started.html](http://dev.mysql.com/usingmysql/get_started.html)
2. Netbeans - <http://netbeans.org/kb/docs/java/quickstart.html>

#### **Suggested Websites on e-Governance**

- [www.mit.gov.in](http://www.mit.gov.in)
- [www.esevaonline.com](http://www.esevaonline.com)
- [bhoomi.kar.nic.in](http://bhoomi.kar.nic.in)
- [aponline.gov.in](http://aponline.gov.in)
- [www.chips.nic.in](http://www.chips.nic.in)

#### **Suggested Websites on e-Business**

- [www.salesforce.com](http://www.salesforce.com)
- [www.zoho.com](http://www.zoho.com)
- [www.itcportal.com](http://www.itcportal.com)

#### **Suggested Websites on e-Learning**

- [www.moodle.org](http://www.moodle.org)
- [www.atutor.ca](http://www.atutor.ca)
- [www.w3schools.com](http://www.w3schools.com)
- [portal.unesco.org](http://portal.unesco.org)