**Department of Physics**

**Govt. Science College, Jabalpur**

1. **PSOs of M.Sc. Physics**
2. Escalating sufficient academic and realistic background/understanding of physics as per UGC framework.
3. Recapitulating mathematical milieu to comprehend and explain the intricacies involved in most of the physical processes.
4. Understanding fundamental concepts of classical and statistical mechanics to put in plain words the explanation of physical events with appreciable limitations.
5. Refreshing the concepts of electrodynamics, condensed matter physics, Nuclear & particle physics, atomic & molecular physics for better understanding of advanced physical concepts.
6. Understanding in detail the basic and advanced concepts of quantum mechanics because the nature is governed by regulations of quantum mechanics.
7. Explicating the essential features of electronic devices and related techniques to have a perceptive of many household electronic devices.
8. Enhancing the capability of measurements and calculations by introducing a course on computer and programming methods.
9. Understanding advanced and special/elective subjects like plasma physics, lasers, advanced electronics and their applications for welfare of mankind.
10. Performing handful of experiments/projects as per program framework.
11. **COs of the Course ‘Mathematical Physics’**
12. Realizing the basic concepts and applications of tensor analysis and Green’s function.
13. To have the basic knowledge and application of Bessel’s, Legendre’s, Hermite’s and Laguerre’s functions/polynomials.
14. To have the basic foundation of integral transforms and complex analysis.
15. Understanding group theory and its applications in electronic structure of various crystals.
16. Identifying and solving tutorial problems on above topics.
17. **COs of the Course ‘Classical Mechanics’**
18. Understanding Langrangian formulation and its applications.
19. Realizing Hamiltonian formulation of classical mechanics to explain Kepler’s problem and canonical transformations.
20. Describing the theory/problems of small oscillations and rotating co-ordinate systems.
21. To appreciate the symmetries of space and time including the concepts of invariance, 4-vectors/scalars, Lorentz transformations and Hamiltonian formulation in relativistic mechanics.
22. Identifying and solving tutorial problems on above topics given in text and reference books.
23. **COs of the Course ‘Electronic Devices’**
24. To become skilled at the basic concepts of JFET, BJT, MOSFET, MESFET and microwave devices.
25. To study and understand the various photonic devices including diode lasers and their applications.
26. To be acquainted with the concepts and applications of digital integrated circuits and operational amplifiers.
27. Describing memory devices and the devices based on electro/magneto/acousto-optic, piezoelectric, and surface acoustic effects.
28. Solving tutorial problems based on above topics.
29. Performing laboratory experiments/project on above topics/concepts to realize the physics behind them.
30. **COs of the Course ‘Computational Methods and Programming’**
31. Learning the essential components of programming in BASIC.
32. Understanding the computational skills of solving linear and non-linear algebraic/transcendental equations including simultaneous linear equations.
33. Being comfortable with the techniques of obtaining Eigen values & Eigen vectors of matrices, curve-fitting and numerical differentiation & integration.
34. Realizing the basic concepts of random variables, numerical solution of ordinary and partial differential equations.
35. Identifying and solving tutorial problems based on above topics.
36. Performing computer based laboratory experiments/project on above topics/concepts.
37. **COs of the Course ‘Quantum Mechanics-I’**
38. Answering why and how quantum mechanics with understanding of basic postulates and solution of Schrodinger equation for one dimensional problems.
39. Having basic knowledge of linear vector space, Bra and Ket algebra, matrix theory and uncertainty relations.
40. Solving Schrodinger wave equation for three dimensional problems like H-atom, harmonic oscillator, square well potential and their application to atomic spectra, molecular spectra and deuteron.
41. Understanding angular momentum in quantum mechanics, its matrix representation and coupling, Pauli spin matrices and the concept of Clebsch-Gorden coefficients.
42. Identifying and solving tutorial problems based on above topics.
43. **COs of the Course ‘Statistical Mechanics’**
44. Understanding foundations of statistical mechanics and its association with thermodynamics to solve countless physical problems.
45. Describing Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein statistics.
46. Explaining cluster expansion of a classical gas, dynamical model of phase transition and Landau theory of phase transition.
47. Elucidating thermodynamical fluctuations and Brownian motion on the basis of Langevin’s theory and Fokker-Planck equation.
48. Solving tutorial problems on above topics.
49. **COs of the Course ‘Electrodynamics and Plasma Physics’**
50. Reviewing basics of electrostatics and magnetostatics to comprehend Maxwell’s equations and their solution in various media.
51. Understanding radiations and related physics by moving charges, the concepts of retarded potentials and Abrahm-Lorentz method of self force.
52. Describing 4-vectors and Lorentz transformation in 4-dimensional space to revise invariance of charge & potential under Lorentz transformation and furthermore the motion of charged particles in electromagnetic fields.
53. Learning magnetohydrodynamic equations/waves, magnetosonic waves, Alfven waves and their applications in the cram of plasma.
54. Solving questions based on tutorial problems casing above topics/concepts.
55. **COs of the Course ‘Condensed Matter Physics’**
56. To understand interaction of x-rays with matter, x-ray diffraction for structure determination, defects in solids and the electron microscopic techniques.
57. Learning band theory of solids, classification of solids, concept of effective mass, Fermi surface and de Hass von Alfen effect.
58. Understanding atomic and molecular polarizability, quantum Hall effect, magnetoresistance, superconductivity and the general idea of high Tc superconductivity.
59. Explaining magnetic properties of solids, Optical reflectance, Photoelectromagnetic effect, Faraday effect and the elements of Raman effect in solids.
60. Solving tutorial problems casing above topics and questions based on them.
61. Performing laboratory experiments/project as per course framework to understand the physics behind above topics/concepts.
62. **COs of the Course ‘Quantum Mechanics-II’**
63. Learning approximation methods for bound states, i.e. perturbation theory, variation method and WKB approximation method with their application to physical problems.
64. Understanding the concepts of time dependent perturbation theory, adiabatic and sudden approximation, absorption and induced emission, transition probability and Einstein’s A and B coefficients.
65. Studying physical concepts of the theory of scattering and its applications.
66. Exploring the application of Schrodinger’s and Dirac’s relativistic equations in understanding negative energy states and hyperfine splitting of energy states.
67. Solving tutorial problems on above topics/concepts to realize the practical application of quantum mechanical techniques studied.
68. **COs of the Course ‘Nuclear and Particle Physics’**
69. Learning fundamental nuclear interactions and reactions with probable consequences.
70. Understanding nuclear models and associated physics.
71. Exploring theories of nuclear decays and general principles of nuclear radiation detectors.
72. Acquiring the basic understanding of elementary particle physics with inputs of cosmic rays and their characteristics.
73. Identifying and solving tutorial problems as per course agenda and answering questions based on them.
74. **COs of the Course ‘Condensed Matter Physics-I’**
75. Realizing the concept and mechanism of imperfections in solids and their several applications in understanding the properties of solids.
76. To understand experimental methods of observing imperfections and realizing the use of electron microscopy, scanning, tunneling and atomic force microscopy.
77. Understanding extensively the properties of thin films and surfaces and furthermore their potential applications.
78. Explaining the concepts of lattice dynamics to understand thermal conductivity and optical properties of solids.
79. Identifying and solving tutorial problems as per course agenda and answering questions based on them.
80. Performing laboratory experiments/project as per course structure to comprehend the physics behind above topics/concepts.
81. **COs of the Course ‘Electronics-I’**
82. To understand the basic elements of communication electronics, microwave transmission and satellite communication.
83. To appreciate the construction, operation and application of microwave devices and radar.
84. Learning the operation of Intel 8085 microprocessor its interrupts.
85. Analyzing potential aspects of programmable interface devices and interfacing with D/A & A/D converters.
86. Answering short questions based on tutorial problems on above topics/concepts.
87. Performing sophisticated laboratory experiments/project as per course structure to figure out the physics behind above topics/concepts.

1. **COs of the Course ‘Atomic and Molecular Physics’**
2. To explain the quantum states of one electron and two electron systems, interaction energy in LS & JJ couplings, hyperfine structure and broadening mechanisms.
3. Understanding the types of molecules, energy levels and intensity of their rotational spectra.
4. Understanding vibrational spectra of diatomic molecules with inputs of energy levels and operation of IR spectrometer.
5. Learning the concepts, techniques and instrumentation of ultraviolet, visible and infrared spectroscopy such as Raman, Photoelectron, Photoacoustic, Mossbauer and NMR spectroscopy.
6. Answering short questions based on tutorial problems on above topics/concepts.
7. Performing sophisticated laboratory experiments/project as per course structure to figure out the physics behind above topics/concepts.
8. **COs of the Course ‘Physics of Lasers and its Applications’**
9. Going through the basic foundation and working principle of laser and related physics.
10. Understanding the structure and basic operating principle different laser systems and their applications.
11. Learning laser induced spectroscopic techniques and application of lasers in fiber optics, medical and engineering.
12. Describing the concepts of electro-optic effect, non-linear interaction of light with matter, laser induced multi-photon processes and optical bi-stability.
13. Answering questions based on tutorial problems on above topics/concepts.
14. Performing sophisticated laboratory experiments/project on assorted applications of lasers and allied techniques.
15. **COs of the Course ‘Condensed Matter Physics-II’**
16. Understanding interaction of electrons with acoustic and optical phonons, theories of superconductivity with basic ideas of high Tc superconductivity.
17. Describing point defects in crystals and structure/symmetries of liquids.
18. Learning special carbon solids such as Fullerenes/Tubules and definition, properties, methods of synthesis and techniques for characterization of nanostructured materials.
19. Describing disorders in condensed matter with structural description and physics of glasses and liquids.
20. Learning answers of questions based on tutorial problems.
21. Performing sophisticated laboratory experiments/project on above topics/concepts.
22. **COs of the Course ‘Electronics-II’**
23. Learning the advanced functional concepts of digital communication and associated physics.
24. Understanding noise, computer communication systems with introduction to mobile radio and satellites.
25. Learning the operation of 8086 microprocessor with techniques of assembly language programming.
26. Understanding 8086 system connection timings, its digital and analog interfacing with elementary idea about 80816, 80286, and 80386 to Pentium processors.
27. Learning how to answer short questions based on tutorial problems.
28. Performing sophisticated laboratory experiments/project on above topics/concepts.
29. **COs of the Course ‘Project Work’**
30. Carrying out a job oriented major project as per program framework on a contemporary topic of public importance.
31. Preparing a Dissertation containing different aspects of the project with important conclusions.
32. Learning how to prepare a presentation to defend the selection and outcomes of the major project.
33. Understanding the important future applications of the major findings during the course of the project work.
34. Undergoing a viva voce of the major project work.
35. **PSOs of B.Sc. Physics**
36. Understanding the basic concepts and foundation of mathematical physics, mechanics and properties of matter.
37. Explaining the thermodynamics of nature and natural phenomena on the basis of statistical physics tools.
38. Going through the principles of optics and optical phenomena and understand the working of optical instruments.
39. Acquiring the knowledge and understanding of electrostatics, magnetostatics and electrodynamics to explain the charge and current related concepts.
40. Understanding quantum mechanical tools and foundation of spectroscopy to analyse and explain the nature and natural phenomena.
41. Applying basics of solid state physics to appreciate the operation of useful devices.
42. Performing experiments as per laboratory framework to verify the laws of physics and physical processes involved in useful physical devices.
43. Understanding the applications of physical sciences in other numerous fields.
44. Understanding of carrying out minor/major projects as per the program standard.
45. **COs of the Course ‘Mathematical Physics, Mechanics and Properties of Matter’**
46. To ascertain basic mathematical background for expressing and understanding physical laws and principles.
47. Acquiring the in theory and practice the intricacies of mechanics which starts from velocity, acceleration and ends with the motion of system of particles.
48. Understanding the general properties of matter which includes the basic concepts of elasticity, surface tension and viscosity.
49. To explain the basics of oscillations and motion of rigid bodies.
50. To realize the concepts of relativistic mechanics and going through the developments in physics up-to 18th century.
51. Performing laboratory experiments/project as per the course contents.
52. **COs of the Course ‘Thermodynamics and Statistical Physics’**
53. Developing the concepts of basic thermodynamical laws and processes to study different heat/steam engines and their efficiencies.
54. Understanding the concept of entropy and its variation in different thermodynamical processes to further study diverse temperature scales and Maxwell’ thermodynamical relations.
55. Explaining thermodynamical systems using tools of statistically physics.
56. To establish the concepts of Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics for understanding various thermodynamical systems.
57. Familiarization with the contributions of distinguished physicists.
58. Performing experiments/project as per course contents and laboratory framework.
59. **COs of the Course ‘Optics’**
60. Learning the basic principles of geometrical optics, image formation and working of optical instruments.
61. Describing interference, interferometers and their application in determination of wavelength, wavelength difference and spectral widths.
62. Understanding diffraction, diffraction gratings, dispersive and resolving powers.
63. Conceptualizing polarization of light and understanding related phenomena.
64. Explaining theoretical and practical aspects of lasers and photo-sensors.
65. Performing experiments/project as per course contents and laboratory framework to understand the working principles of various optical instruments.
66. **COs of the Course ‘Electrostatics, Magnetostatics & Electrodynamics’**
67. Learning basics of electrostatics starting from Coulomb’s law to the concepts of capacitors and explaining the relations between **D**, **E** and **P**.
68. Understanding basic concepts of magnetostatics and realizing the relationship between **B**, **H** and **M**.
69. Analyzing growth and decay of current in LCR circuits and understanding elementary concepts of bioelectricity.
70. Explaining the fundamental concepts/applications associated with motion of charged particles in electric and magnetic fields.
71. Describing electromagnetic induction, Faraday’s laws, self and mutual induction, transformers, Maxwell’s equations, Poynting vector and understanding finally the propagation of electromagnetic waves in diverse media.
72. Realizing sophisticated experiments/project to observe the practical application of above concepts.
73. **COs of the Course ‘Quantum Mechanics and Spectroscopy’**
74. Understanding basic postulates of quantum mechanics and the formalism of Schrodinger’s equation.
75. Formulation of time independent Schrodinger wave equation to study different quantum mechanical problems.
76. Introduction of atomic spectroscopy which starts from Bohr’s model and ends with Moseley’s law.
77. Understanding molecular spectroscopy with introduction of various types of spectra and the physics behind them.
78. Describing basic properties of nucleus, its stability, nuclear radiations, nuclear reactions, nuclear models and finally the concepts of nuclear fission/fusion.
79. **COs of the Course ‘Solid State Physics and Devices’**
80. Realizing the concepts of crystal structure and binding in solids to understand band theory and related physics.
81. Understanding the theories behind specific heat, electrical resistivity and magnetism in solids.
82. Identifying importance of semiconductors and describing physics of semiconductors to understand the working of electronic devices like Zener diode, Photo diode, LED, Solar cell, Transistor and JFET.
83. Describing transistor amplifiers in CB, CE, CC configurations, Class A, B, C amplifiers, RC-coupled amplifiers, Feedback amplifiers, Oscillators and the basic concepts of modulations /demodulations.
84. To understand essential differences in structures, properties and applications of bulk and nanomaterials by discussing the basic concepts of density of states, surface and interface effects, quantum size effects, synthesis of nanoparticles and nanolithography.
85. Realizing sophisticated experiments/project to observe the practical application of above concepts.
86. Carrying out major project as per program framework to solve a contemporary physical problem.
87. **PSOs of B.Sc. Electronics**
88. Recognizing the understanding and fundamental concepts of semiconductor devices which have become the essential components of our day to day life.
89. Explicating the essential features of electronic circuits and related techniques to have an understanding of many household electronic devices.
90. Being familiar with the concepts of digital electronics, microprocessors, operational amplifiers and related electronic systems to realize the intricacies of instrumentation.
91. Acquiring the basics of power electronics, electrical motors and advanced microprocessor for development of sufficient skills in the related areas.
92. Understanding different electronic communication systems and their applications for the welfare of mankind.
93. Performing experiments as per laboratory framework to have the practical know-how of different electronic devices.
94. Understanding the applications of electronics in other numerous fields.
95. Developing practical skills to handle the management of different useful household electronic devices.
96. Carrying out minor/major project work as per the program standard.
97. **COs of the Course ‘Basics of Semiconductors and Devices’**
98. Learning passive components of electronic circuits, transformers and PCB.
99. Explaining resonance circuits and network theorems to analyze electronic circuits.
100. Understanding semiconductor physics with concepts of Fermi level, drifting and diffusion of charge carriers.
101. Learning physics of PN junction with basic idea and working of different diodes and solar cell.
102. Examining the construction, working principle and usefulness of transistor and its characteristics in different modes.
103. Development of practical skills to use diodes and transistors in different electronic circuits.
104. **COs of the Course ‘Electronic Circuits and Fundamentals of Digital Electronics’**
105. Understanding the basic idea of different rectifiers and their usefulness in unregulated and regulated power supplies.
106. Learning the construction, working and applications of field effect transistors.
107. Describing practical applications of different amplifiers with concept and advantage of negative feedback in them.
108. Understanding the applications of diodes and transistors in multivibrators and oscillators.
109. Learning basic principles and experimental techniques of digital electronics.
110. Developing practical skills to study different electronic circuits with inputs of digital electronics.
111. **COs of the Course ‘Digital Electronics and Microprocessor’**
112. Learning elementary concepts of logic gates, arithmetic circuits and flip flops as building blocks of digital electronics.
113. Understanding logic families, counters and registers.
114. Explaining D/A & A/D converters with concepts of memories.
115. Acquiring the basic knowledge of microprocessor, instruction set of 8085 microprocessor and basic straight line programming.
116. Learning interfacing and basic interfacing devices with introduction to personal computers.
117. Performing experiments/project on above topics/concepts.
118. **COs of the Course ‘Operational Amplifier and Instrumentation’**
119. To go through the working of differential amplifier, operational amplifier and the parameters of operational amplifier.
120. Learning applications of operational amplifier with elementary ideas of active filters.
121. Learning the construction basic operation and fundamental applications of cathode ray oscilloscope (CRO).
122. Understanding basic concepts of signal generation with working and applications of IC 555 timer and IC 8038 function generator.
123. Learning basic electronics of measuring instruments and the operation of different types of multimeters and counters.
124. Performing laboratory experiments/project on above topics/concepts.
125. **COs of the Course ‘Power Electronics, Electrical motors and Advanced Microprocessor’**
126. Acquiring the basic working knowledge of different power devices such as power diodes, power transistors, UJT, SCR, DIAC, TRIAC and performing their comparative study.
127. To illustrate the various applications of SCR and discuss the construction and working of power inverters.
128. Understanding the construction, working and applications of electrical motors.
129. Discussing the basic architecture and organization of INTEL 8086 microprocessor.
130. To be acquainted with the special architectural features of INLET 8086 microprocessor and related programming using macros and call procedures.
131. Performing sophisticated experiments/project on UJT, SCR, DIAC, TRIAC, and assembly language programming using INTEL 8086 microprocessor.
132. **COs of the Course ‘Communication System’**
133. Understanding basic theory of noise and radio wave propagation.
134. Explaining the need and techniques of amplitude modulation in communication system.
135. Describing the basic elements of frequency, phase and pulse modulation and understanding their role in transmission.
136. Discussing the role of antennas and their types to fully appreciate the concepts of television engineering.
137. Realizing the basics of satellite communication and understanding wireless communication system such as cellular telephony.
138. Performing handful of laboratory experiments/project on above topics/concepts.
139. Carrying out major project as per program framework to solve a contemporary physical problem.
140. **PSOs of B.Sc. Computer Application**
141. Understanding basic concepts, functional knowledge and usefulness of computer application for a better career in this field.
142. Explaining the essential features of desktop publishing and multimedia.
143. Acquiring the basic knowledge of FOXPRO, HTML and CORE JAVA with a sound background of their applications in other branches of science.
144. Going through the basics of ASP.NET, ORACLE and VB.NET for better understanding of computational skills based on these systems.
145. Developing a good foundation and concepts of system analysis, MIS and networking.
146. Using Knowledge of computer application in recognizing, managing and solving many complex practical problems.
147. Applying the concepts and techniques of computer application in other numerous fields of science education.
148. Performing hands-on experiments/projects as per program framework to have the practical applications of computer programming and related techniques.
149. Managing many of the physical systems with the help of computers.
150. **COs of the Course ‘Fundamentals of Computer and PC Software’**
151. Learning basics of computer system, system and application softwares.
152. Understanding fundamentals of operating system and introductory features of MS Windows.
153. Realizing the basic features and applications of MS Word, MS Excel and MS Power Point.
154. Describing and learning Design Support System with inputs of Expert Systems and consequently understanding Management Information System (MIS).
155. Going through the various basic features and applications of Internet and realizing e-banking and its benefits.
156. Performing experiments/project as per course framework to understand the practical applications of MS Word, MS Excel and MS Power Point.
157. **COs of the Course ‘Desktop Publishing and Multimedia’**
158. Learning the importance and advantages of DTP, DTP software and hardware.
159. Understanding basics of graphics & graphics programs, fonts, printers, plotters and scanners.
160. To examine the various application features of PageMaker with understanding its history and different versions.
161. To understand the various components of multimedia, their features and usefulness in data analysis and communication.
162. Performing computer experiments as per course framework to understand the practical applications of MS Word, MS Excel, MS Power Point and PageMaker.
163. **COs of the Course ‘FoxPro, HTML and Core Java’**
164. Appreciating the basic concepts of DBMS with introduction to FoxPro.
165. Understanding the characteristic features and applications of FoxPro programming.
166. Learning HTML structure, Formatting, Graphics, Links, Lists, and Tables with inputs of creating Forms.
167. Learning and analyzing the history, evolution and individuality of Java language with introduction to branching statements.
168. Acquiring the basic concepts and features of Looping, Multithread and Applet programming.
169. Performing a number of computer experiments/project as per course framework.
170. **COs of the Course ‘ASP.NET and Oracle’**
171. Reviewing the introductory features of ASP.NET and understanding form validation & validation control.
172. Learning the intricacies of ASP.NET programming and its applications.
173. Understanding Oracle Philosophy with inputs of interactive SQL and data constraints.
174. Learning computations in expression lists used to select data.
175. Understanding fundamentals of views and PL/SQL syntax.
176. Performing a number of computer experiments/project on above topics/concepts.
177. **COs of the Course ‘VB.NET’**
178. Reviewing basic concepts of VB.NET and the Environment.
179. Understanding basic features of VB.NET language and control flow statements.
180. Understanding working with forms with inputs of designing menus.
181. Learning object oriented programming with overview of OLE.
182. Realizing database programming with ADO.Net framework.
183. Performing a number of computer experiments/project on above topics/concepts.
184. **COs of the Course ‘System Analysis & Design, MIS and Networking’**
185. Learning the concept of system and role of system analyst.
186. Understanding system planning, system analysis and system performance with details of cost/benefit analysis.
187. Going through the concepts of system design, system testing and software maintenance.
188. Understanding different parameters of management information system (MIS) and its copious applications.
189. Learning the need & applications of networking in data communication with introduction to Internet.
190. Performing a number of computer experiments/project on above topics/concepts.
191. Carrying out major project as per program framework to solve a contemporary physical problem.
192. **PSOs of B.Sc. Computer Maintenance**
193. Understanding of computer fundamentals, application and system hardware/software which are essential for all practical purposes.
194. Explicating the essential features of programming and problem solving through C and C++ with special emphasis on object oriented programming.
195. Appreciating the basic principles and applications of microprocessor, interfacing, data transfer and communication.
196. Developing skills of computer maintenance to create opportunities of better job prospects in computer market.
197. Acquiring the concepts of advance peripherals, PC maintenance and related trouble-shootings.
198. Understanding the essential features of computer networking, its application and trouble-shootings.
199. Developing practical skills to handle the management of different computer systems and furthermore to solve practical issues if any.
200. Performing computer experiments/projects as per program framework to have the practical know-how of different programming software and trouble-shootings.
201. Understanding the applications and usefulness of computer maintenance for solving the noticeable practical problems.
202. **COs of the Course ‘Application of System Software’**
203. Reviewing computer fundamentals and operating system.
204. Understanding DOS, Application software, System software and their applications.
205. Learning operating systems in detail with processor, memory and information management.
206. Understanding the features and usefulness of MS Windows and its accessories.
207. Learning application software documentation using MS Word, MS Excel and MS Power Point.
208. Performing computer experiments/project as per laboratory framework on above topics.
209. **COs of the Course ‘Programming & Problem Solving through C & C++’**
210. Learning fundamentals of programming in C.
211. Understanding basics of arrays, pointer, strings and structure.
212. To differentiate procedure oriented programming with object oriented programming.
213. Learning constructors and destructors with details of operator overloading, type conversions, inheritance and virtual base classes.
214. Understanding pointers, operations C++ streams, C++ stream classes and managing output with manipulators.
215. Performing computer experiments/project as per laboratory framework on C and C++ programming.
216. **COs of the Course ‘Microprocessor, Interfacing, Data Transfer and Communication’**
217. To acquire introductory concepts of Intel 8086 microprocessor and other Intel processors like 80286, 80386, 80486, Pentium and Pentium Pro.
218. Understanding various Interrupts with general idea of digital interfacing.
219. Learning distinction between system and application softwares, assembler and assembly language programming.
220. Going through the basic ideas of A/D and D/A interfacing, multiple microprocessor system and buses.
221. Understanding and explaining the concepts of data communication starting from asynchronous serial to fiber optic data communication.
222. Performing computer experiments/project as per laboratory framework on above topics/concepts.
223. **COs of the Course ‘System Software and C++ Programming’**
224. Learning hard disc partitioning, formatting and low level programming.
225. Understanding lexical analysis and parser with inputs of compiler designing.
226. Learning software tools for program development, system tools, algorithm and flowcharts.
227. Realizing understanding of C++ programming with concepts of functions.
228. Describing core object concepts, structures, classes, memory, arrays, strings, fundamentals of operator, overloading and inheritance.
229. Performing experiments/project on C++ programming, debug monitor, CMOS setups, formatting and system tools.
230. **COs of the Course ‘Advanced Peripherals, PC Maintenance and Trouble Shooting’**
231. Learning types & specifications of microprocessor, power supply and chassis with processor and power supply troubleshooting techniques.
232. Understanding motherboard and buses with idea of ATA/IDE interface.
233. Exploring basics of memory, flash memory devices and DVD with inputs of troubleshooting techniques.
234. Understanding USB, Serial Port, SCSI Interface and Microcontrollers with skills of hardware and preventive maintenance.
235. Identifying and detecting computer viruses, using antivirus and vaccines as counter measure and understanding different troubleshooting processes.
236. Performing experiments/project on troubleshooting, motherboard, data recovery, viruses & antivirus and furthermore the installation of an antivirus software.
237. **COs of the Course ‘Computer Networking and Troubleshooting’**
238. Understanding networking fundamentals, reference models and Ethernet.
239. Realizing hardware elements for networking.
240. Constructing local area network with multiplexing, high speed digital access and DSL technology.
241. Understanding basics of network security, protection and related troubleshooting.
242. Learning fundamentals of cloud computing and developing cloud services.
243. Performing experiments/project on troubleshooting, motherboard, data recovery, viruses & antivirus and furthermore the installation of an antivirus software.
244. Performing experiments/project on installation of LAN, Remote Control Desktop, Server-Client Network and Norton Internet Security.
245. Carrying out a major project based on industrial training.
246. **PSOs of BCA**
247. Learning fundamentals of computer, theory of operating systems, PC packages, elements of mathematical foundation including inputs of numerical methods & analysis with sound background of communicative English.
248. Understanding the intricacies of programming in C, C++, Java, VB.net & ASP.net with their application in solving physical problems of day to day life.
249. Being familiar with the concepts of computer system architecture, computer networks, data base management system with essential elements of data structure and mining.
250. Understanding internet concepts, web designing, cyber security & software engineering with possible applications in numerous fields of knowledge/skills.
251. Explicating the essential features of system analysis & design, MIS, RDBMS (ORACLE), PHP & MYSQL, cloud computing and their potential applications in computer science and engineering.
252. Performing a handful of computer based experiments/projects as per program framework to understand the budding applications of computer systems in various other fields of science.
253. Identifying the requirements, issues and challenges of human life and using computer systems to settle them.
254. Learning practical skills to handle computer based systems and furthermore realizing the consequence of computer applications in solving composite physical tribulations.
255. Preparing a handful of skilled computer professionals to face the challenges of modern digital India.
256. **COs of the Course ‘Fundamentals of Computer and Programming’**
257. Reviewing fundamental concepts of computers with discussion on different generations of computers.
258. Acquiring introductory concepts of input and storage devices.
259. Understanding data processing, CPU and computer output.
260. Learning system softwares and application softwares.
261. Learning high level languages.
262. **COs of the Course ‘Operating Systems (DOS & WINDOWS, UNIX)’**
263. Understanding basics of DOS and DOS internal & external commands.
264. Learning Windows 95/98 and its accessories with inputs of Windows explorer.
265. An overview of UNIX and understanding UNIX commands.
266. Learning general purpose utilities like cal, data, who, try, password etc.
267. Handling ordinary files and associated commands.
268. **COs of the Course ‘PC Package’**
269. Learning features, versions and working of MS Windows with handling of control panel.
270. Understanding basic features of MS Word and working with it.
271. Exploring advanced features of MS Word and its commands.
272. Learning essential features of MS Excel and working comfortably with it.
273. Exploring the significant features and realistic applications of MS Power Point.
274. Performing computer experiments/project as per laboratory framework on above topics/concepts.
275. **COs of the Course ‘Programming in C’**
276. Reviewing basics of data types, operators, keywords, constants with inputs of programming in C.
277. Understanding control statements and loop statements.
278. Learning functions and program structure with multifunction programs.
279. Working with arrays, pointers and functions.
280. Explaining and working with preprocessors & macros, structures, declarations, initialization and use of structures in a C-program.
281. Performing experiments/project on C-programming.
282. **COs of the Course ‘Communicative English’**
283. Learning comprehension which includes understanding the language by reading and listening talks, reports and poems.
284. Development of writing skills which comprise paragraph writing and composition writing.
285. Learning skills of note making and report writing.
286. Exploring application writing and letter writing.
287. Erudition of functional grammar with correct usage and transformation of sentences.
288. **COs of the Course ‘Computer System Architecture’**
289. Going through basics of data representation wherein data types, number systems and fixed point representation are conceptualized.
290. Understanding digital logic circuits with important concepts of Logic gates, Boolean algebra and combinational/sequential circuits.
291. Exploring CPU organizations where ALU, control circuits and introductory concepts of microprocessor are learnt.
292. Learning I/O interface with properties of simple I/O devices and their control.
293. Understanding memory organization and related control techniques.
294. To perform a handful of experiments/project on above topics/concepts.
295. **COs of the Course ‘Internet Concepts and Web Design’**
296. To conceptualize introductory functional features of Internet which include anatomy, history, networking, infrastructure, working, protocols, services, address and tools.
297. Learning basic principles and planning of web design.
298. Understanding introduction to HTML, its basic features like table handling, frames and forms.
299. Learning comprehensive features of Java script.
300. Describing and learning site navigation and publishing of website.
301. To execute a handful of experiments/project on above topics/concepts.
302. **COs of the Course ‘OOP with C++’**
303. Understanding basic principles of object oriented programming in C++.
304. Learning tokens expressions, control structures and functions in C++ programming.
305. Describing and learning classes and objects with diverse features and applications.
306. Conceptualizing constructors, destructors, operators overloading and type conversions in C++ programming.
307. Understanding inheritance, pointers virtual functions and polymorphism.
308. To execute computer experiments/project as per course framework on above topics/concepts.
309. **COs of the Course ‘Data Base Management system’**
310. Understanding the diverse features of data base system.
311. Learning relational data structure and its components.
312. Understanding query language and associated concepts.
313. Exploring relational data base design and related operations.
314. Understanding hierarchical and network approaches to study an IMS system.
315. Executing computer based experiments/project as per course framework on above topics/concepts.
316. **COs of the Course ‘System Analysis & Design and MIS’**
317. Going through the basic features and characteristics of a system.
318. Learning system planning and analysis with inputs of system performance, feasibility analysis, cost/benefit analysis and data analysis.
319. Exploring the ideas of system design, system testing, system implementation and software maintenance.
320. Understanding the basic features and tools of management information system.
321. Learning management of MIS department with basic understanding of decision support system.
322. Executing computer based experiments/project on above topics/concepts.
323. **COs of the Course ‘Cyber Security’**
324. Learning basics of communication systems, local area networks, wireless networks and Internet.
325. Understanding security principles, threats and attack techniques with inputs of security management, authentication and access control identification.
326. Exploring cryptographic mechanism, digital signatures, encryption, security levels & categories, hardware security features and protecting memory.
327. Examining different security models with understanding of network security, IP security, firewalls and intrusion detection.
328. Comparing UNIX security and Windows security with reference to general security principles and administration/management issues.
329. **COs of the Course ‘Data Structure and Algorithms’**
330. Reviewing fundamentals of data structure with concepts and applications of stacks and queues.
331. Understanding linked lists of stacks and queues and their applications.
332. Understanding trees with basic terminology, representations and counting.
333. Learning different aspects of searching and sorting.
334. Learning techniques, representations and applications of tables & graphs.
335. Executing computer based experiments/project as per course framework on data structure.
336. **COs of the Course ‘Mathematical Foundation’**
337. Reviewing basics of Boolean algebra, algebra of electric circuits and Boolean function of fundamental forms.
338. Learning Sets and operation on Sets with basics of Cartesian product of Sets and relations.
339. Understanding elementary techniques of differentiation and its applications.
340. Learning elementary concepts and tools of integration and its applications.
341. Exploring different features of graph theory and learning definition, types and isomorphism of graphs with idea of connected graphs and trees.
342. **COs of the Course ‘RDBMS (ORACLE)’**
343. Understanding basics features such as product details, architecture, files, user process, memory and data types of Oracle.
344. Working with built-in functions, tables and data in Oracle.
345. Understanding Oracle security system and working with sequences.
346. Learning different features and operations in PL/SQL.
347. Understanding exception handling in PL/SQL with inputs of triggers, syntax and deleting.
348. Performing computer based experiments/project as per course framework on SQL and PL/SQL.
349. **COs of the Course ‘Programming in VB.NET’**
350. Understanding introductory concepts of .NET, different Tabs with inputs of visual development & event driven programming.
351. Learning different components of VB.NET language and the associated control flow statements.
352. Working with Forms and Designing Menus.
353. Learning and understanding diverse features and applications of object oriented programming.
354. Learning data base programming with ADO.NET and working with it.
355. Performing a handful of computer based experiments/project as per course framework on VB.NET and its applications.
356. Carrying out minor project on a contemporary topic of public importance.
357. **COs of the Course ‘Theory of Operating System’**
358. Learning basics of operating system and its features.
359. Going through the fundamentals of process management with stress on process scheduling, operation on processes, threads and algorithm evaluation.
360. Understanding techniques of process synchronization.
361. Exploring the background and concepts of memory management.
362. Describing and learning file system interface and different I/O systems.
363. **COs of the Course ‘Software Engineering’**
364. Understanding different software processes with software requirement analysis and specification.
365. Learning how to plan a software project with inputs of quality assurance, verification & validation, monitoring and risk management.
366. Learning principles, methodology and testing of function oriented design.
367. Exploring fundamental strategies and techniques of software testing methods.
368. Understanding software re-engineering, software maintenance and computer-aided software engineering.
369. **COs of the Course ‘Numerical Methods and Analysis’**
370. Working with basic computer arithmetic.
371. Learning matrices & operations on matrices, elementary transformations and solution of non-homogeneous linear equations.
372. Finding roots of a system of linear algebraic equations.
373. Working with Newton’s and Lagrange’s interpolation formula with inputs of Newton’s divided difference interpolation formula.
374. Learning the techniques of numerical differentiation and integration.
375. **COs of the Course ‘Computer Networks’**
376. Understanding needs and advantages of networks, types, network topology, network protocols and selection/design of networks for an organization.
377. Learning different components and features of signal transmission.
378. Understanding OSL, IEEE 802 & TCP/IP models, Ethernet, Token Ring and Network Scaling.
379. Exploring networking technologies like fiber channel, network connectivity and internet connectivity.
380. Learning various server & clients’ hardware and software such as ISP, URL, addresses, e-mail and concepts of internet security.
381. **COs of the Course ‘Programming in Java’**
382. Reviewing Java evolution, history, features, hardware/software requirements and Java support systems with broad overview of Java language.
383. Learning decision making statements and the concept of branching in Java programming.
384. Understanding classes, objects and methods with inputs of arrays, strings and vectors.
385. Exploring the concept of multithread programming in Java.
386. Going through the features and techniques of applet programming.
387. Performing a handful of computer based experiments/project as per course framework on programming in Java and its applications.
388. **COs of the Course ‘Data Mining’**
389. Understanding principles and basic concepts in data mining with inputs of additional data mining tasks.
390. Learning the techniques of text mining and recommender systems.
391. Going through the intricacies of web data analysis.
392. Exploring the concepts of social network analysis.
393. Understanding neural networks and learning curves & performance optimization.
394. **COs of the Course ‘Programming with ASP.NET’**
395. Going through the concept of hypertext, versions & elements of html, building of html documents, different html tags, use of frames and forms in web pages and ASP & html forms.
396. Understanding overview of dynamic web pages with introduction, features controls & applications of ASP.NET and elements of web forms, form validation & validation control.
397. Learning overview of ADO.NET with understanding of basics of XML in .NET and XML data document.
398. Exploring web services with understanding of state management, SOAP, threading concepts and .NET security features.
399. Describing and understanding overview of C# and .NET with language features, delegates and reflection.
400. Performing computer based experiments/project as per course framework on programming in ASP.NET and its applications.
401. **COs of the Course ‘PHP and MYSQL’**
402. Understanding history, versions, features and advantages of PHP over other scripting languages.
403. Exploring basic html, functions and PHP arrays.
404. Learning PHP file permissions and working with files, directory & forms.
405. Working with PHP-supported data base and learning how to use PHP and My SQL.
406. Understanding code re-use, file system functions & file I/O, use of CSS and introduction to object oriented programming with PHP.
407. **COs of the Course ‘Cloud Computing’**
408. Understanding historical developments, version, characteristics and environment of cloud computing with overview of cloud applications.
409. Learning cloud computing architecture, types, cloud solutions and cloud offerings.
410. Going through the intricacies of cloud management and virtualization technology.
411. Exploring cloud information security fundamentals, cloud security services, cloud computing security challenges and architecture.
412. Understanding markets based management of clouds, federated clouds and inter clouds.
413. **COs of the Course ‘Major Project and Dissertation’**
414. Carrying out a major project as per program framework on a contemporary topic of public importance.
415. Preparing a Dissertation containing different aspects of the project with important conclusions.
416. Learning how to prepare a presentation to defend the selection and outcomes of the major project.
417. Understanding the important future applications of the major findings during the course of the project work.
418. Undergoing a viva voce of the major project work.