# **Core Programming**

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| 24 | Software Engineering Knowledge |
| 25 | Core Principles |
| 26 | Principles That Guide Each Framework Activity |
| 27 | Summary |
|  | **Understanding Requirements** |
| 28 | Requirements Engineering |
| 29 | Establishing the Groundwork |
| 30 | Eliciting Requirements |
| 31 | Developing Use Cases |
| 32 | Building the Requirements Model |
| 33 | Negotiating Requirements |
| 34 | Validating Requirements |
| 35 | Summary |
|  | **Requirements Modeling: Scenarios, Information, and Analysis Classes** |
| 36 | Requirements Analysis |
| 37 | Scenario-Based Modeling |
| 38 | UML Models That Supplement the Use Case |
| 39 | Data Modeling Concepts |
| 40 | Class-Based Modeling |
| 41 | Summary |
|  | **Requirements Modeling: Flow, Behavior, Patterns, and WebApps** |
| 42 | Requirements Modeling Strategies |
| 43 | Flow-Oriented Modeling |
| 44 | Creating a Behavioral Model |
| 45 | Patterns for Requirements Modeling |
| 46 | Requirements Modeling for WebApps |
| 47 | Summary |
|  | **Design Concepts** |
| 48 | Design within the Context of Software Engineering |
| 49 | The Design Process |
| 50 | Design Concepts |
| 51 | The Design Model |
| 52 | Summary |
|  | **Architectural Design** |
| 53 | Software Architecture |
| 54 | Architectural Genres |
| 55 | Architectural Styles |
| 56 | Architectural Design |
| 57 | Assessing Alternative Architectural Designs |
| 58 | Architectural Mapping Using Data Flow |
| 59 | Summary |
|  | **Component-Level Design** |
| 60 | What is a Component |
| 61 | Designing Class-Based Components |
| 62 | Conducting Component-Level Design |
| 63 | Component-Level Design for WebApps |
| 64 | Designing Traditional components |
| 65 | Component-Based Development |
| 66 | Summary |
|  | **User Interface Design** |
| 67 | The Golden Rules |
| 68 | User Interface Analysis and Design |
| 69 | Interface Analysis |
| 70 | Interface Design Steps |
| 71 | WebApp Interface Design |
| 72 | Design Evaluation |
| 73 | Summary |
|  | **Pattern-Based Design** |
| 74 | Design Patterns |
| 75 | Pattern-Based Software Design |
| 76 | Architectural Patterns |
| 77 | Component-Level Design Patterns |
| 78 | User Interface Design Patterns |
| 79 | WebApp Design Patterns |
| 80 | Summary |
|  | **WebApp Design** |
| 81 | WebApp Design Quality |
| 82 | Design Goals |
| 83 | A Design Pyramid for WebApps |
| 84 | Aesthetic Design |
| 85 | Content Design |
| 86 | Architecture Design |
| 87 | Navigation Design |
| 88 | Component-Level Design |
| 89 | Object-Oriented Hypermedia Design Method (OOHDM) |
| 90 | Summary |
|  | **Part-3: Quality Management** |
|  | **Quality Concepts** |
| 91 | What is Quality |
| 92 | Software Quality |
| 93 | The Software Quality Dilemma |
| 94 | Achieving Software Quality |
| 95 | Summary |
|  | **Review Techniques** |
| 96 | Cost Impact of Software Defects |
| 97 | Defect Amplification and Removal |
| 98 | Review Metrics and Their Use |
| 99 | Reviews: A formality Spectrum |
| 100 | Informal Reviews |
| 101 | Formal Technical Reviews |
| 102 | Summary |
|  | **Software Quality Assurance** |
| 103 | Background Issues |
| 104 | Elements of Software Quality Assurance |
| 105 | SQA Tasks, Goals, and Metrics |
| 106 | Formal Approaches to SQA |
| 107 | Statistical Software Quality Assurance |
| 108 | Software Reliability |
| 109 | The ISO 9000 Quality Standards |
| 110 | The SQA Plan |
| 111 | Summary |
|  | **Software Testing Strategies** |
| 112 | A Strategic Approach to Software Testing |
| 113 | Strategic Issues |
| 114 | Test Strategies for Conventional Software |
| 115 | Test Strategies for Object-Oriented Software |
| 116 | Test Strategies for WebApps |
| 117 | Validation Testing |
| 118 | System Testing |
| 119 | The Art of Debugging |
| 120 | Summary |
|  | **Testing Conventional Application** |
| 121 | Software Testing Fundamentals |
| 122 | Internal and External Views of Testing |
| 123 | White-Box Testing |
| 124 | Basis Path Testing |
| 125 | Control Structure Testing |
| 126 | Black-Box Testing |
| 127 | Model-Based Testing |
| 128 | Testing for Specialized Environments, Architectures, and Applications |
| 129 | Patterns for Software Testing |
| 130 | Summary |
|  | **Testing Object-Oriented Applications** |
| 131 | Broadening the View of Testing |
| 132 | Testing OOA and OOD Models |
| 133 | Object-Oriented Testing Strategies |
| 134 | Object-Oriented Testing Methods |
| 135 | Testing Methods Applicable at the Class Level |
| 136 | Interclass Test-Case Design |
| 137 | Summary |
|  | **Testing Web Applications** |
| 138 | Testing Concepts for WebApps |
| 139 | The Testing Process – An Overview |
| 140 | Content Testing |
| 141 | User Interface Testing |
| 142 | Component-Level Testing |
| 143 | Navigation Testing Configuration Testing |
| 144 | Security Testing |
| 145 | Performance Testing |
| 146 | Summary |
|  | **Formal Modeling and Verification** |
| 147 | The Cleanroom Strategy |
| 148 | Functional Specification |
| 149 | Cleanroom Design |
| 150 | Cleanroom Testing |
| 151 | Formal Methods Concepts |
| 152 | Applying Mathematical Notation for Formal Specification |
| 153 | Formal Specification Languages |
| 154 | Summary |
|  | **Software Configuration Management** |
| 155 | Software Configuration Management |
| 156 | The SCM Repository |
| 157 | The SCM Process |
| 158 | Configuration management for WebApps |
| 159 | Summary |
|  | **Product Metrics** |
| 160 | A Framework for Product Metrics |
| 161 | Metrics for the Requirements Model |
| 162 | Metrics for the Design Model |
| 163 | Design Metrics for WebApps |
| 164 | Metrics for Source Code |
| 165 | Metrics for Testing |
| 166 | Metrics for Maintenance |
| 167 | Summary |
|  | **Part-4: Managing Software Projects** |
|  | **Project Management Concepts** |
| 168 | The Management Spectrum |
| 169 | People |
| 170 | The Product |
| 171 | The Process |
| 172 | The Project |
| 173 | The W5HH Principle |
| 174 | Critical Practices |
| 175 | Summary |
|  | **Process and Project Metrics** |
| 176 | Metrics in the Process and Project Domains |
| 177 | Software Measurement |
| 178 | Metrics for Software Quality |
| 179 | Integrating Metrics within the Software Process |
| 180 | Metrics for Small Organizations |
| 181 | Establishing a Software Metrics Program |
| 182 | Summary |
|  | **Estimation for Software Projects** |
| 183 | Observations on Estimation |
| 184 | The Project Planning Process |
| 185 | Software Scope and Feasibility |
| 186 | Resources |
| 187 | Software Project Estimation |
| 188 | Decomposition Techniques |
| 189 | Empirical Estimation Models |
| 190 | Estimation for Object-Oriented Projects |
| 191 | Specialized Estimation Techniques |
| 192 | The Make/Buy Decision |
| 193 | Summary |
|  | **Project Scheduling** |
| 194 | Basic Concepts |
| 195 | Project Scheduling |
| 196 | Defining a Task Set for the Software Project |
| 197 | Defining a Task Network |
| 198 | Scheduling |
| 199 | Earned Value Analysis |
| 200 | Summary |
|  | **Risk Management** |
| 201 | Reactive versus Proactive Risk Strategies |
| 202 | Software Risks |
| 203 | Risk Identification |
| 204 | Risk Projection |
| 205 | Risk Refinement |
| 206 | Risk Mitigation, Monitoring, and Management |
| 207 | The RMMM Plan |
| 208 | Summary |
|  | **Maintenance and Reengineering** |
| 209 | Software Maintenance |
| 210 | Software Supportability |
| 211 | Reengineering |
| 212 | Business Process Reengineering |
| 213 | Software Reengineering |
| 214 | Reverse Engineering |
| 215 | Restructuring |
| 216 | Forward Engineering |
| 217 | The Economics of Reengineering |
| 218 | Summary |
|  | **Part-5: Advanced Topics** |
|  | **Software Process Improvement** |
| 219 | What is SPI |
| 220 | The SPI Process |
| 221 | The CMMI |
| 222 | The People CMM |
| 223 | Other SPI Frameworks |
| 224 | SPI Return on Investment |
| 225 | SPI Trends |
| 226 | Summary |
|  | **Emerging Trends in Software Engineering** |
| 227 | Technology Evolution |
| 228 | Observing Software Engineering Trends |
| 229 | Identifying ‘Soft Trends’ |
| 230 | Technology Directions |
| 231 | Tools-Related Trends |
| 232 | Summary |
|  | **Concluding Comments** |
| 233 | The Importance of Software – Revisited |
| 234 | People and The Way They Build Systems |
| 235 | New Modes for Representing Information |
| 236 | The Long View |
| 237 | The Software Engineer’s Responsibility |
| 238 | A Final Comment |
|  | **Part-6: Appendix** |
| 239 | An Introduction to UML |
| 240 | Object Oriented Concepts |
|  |  |
|  | **SOFTWARE MAINTANANCE** |

# **Basic Mathematics**

|  |  |
| --- | --- |
|  | **Pure Mathematics (A-Level)** |
|  | **P1: Algebra** |
| 01 | Background Algebra |
| 02 | Linear Equations |
| 03 | Changing the Subject of a Formula |
| 04 | Quadratic Equations |
| 05 | Solving Quadratic Equations |
| 06 | Equations that cannot be Factorized |
| 07 | The Graphs of Quadratic Function |
| 08 | The Quadratic Formula |
| 09 | Inequalities |
|  | **P2: Algebra** |
| 10 | Operations with Polynomials |
| 11 | Solution of Polynomial Equations |
| 12 | The Modulus Function |
|  | **P3: Further Algebra** |
| 13 | The General Binomial Expansion |
| 14 | Review of Algebraic Functions |
| 15 | Partial Functions |
| 16 | Using Partial Functions with The Binomial Expansion |
|  | **P1: Co-Ordinate Geometry** |
| 17 | Co-Ordinates |
| 18 | Plotting, Sketching and Drawing |
| 19 | The Gradient of a Line |
| 20 | The Distance Between Two Points |
| 21 | The Mid-Point of a Line Joining Two Points |
| 22 | The Equation of a Straight Line |
| 23 | Finding the Equation of a Line |
| 24 | The Intersection of Two Line |
| 25 | Drawing Curves |
| 26 | The Intersection of A Line and A Curve |
|  | **P1: Sequences and Series** |
| 27 | Definitions and Notation |
| 28 | Arithmetic Progressions |
| 29 | Geometric Progressions |
| 30 | Binomial Expansions |
|  | **P1: Functions** |
| 31 | The Language of Functions |
| 32 | Composite Functions |
| 33 | Inverse Functions |
|  | **P1: Differentiation** |
| 34 | The gradient of a Curve |
| 35 | Finding the Gradient of a Curve |
| 36 | Finding the Gradient from First Principles |
| 37 | Differentiating by Using Standard Results |
| 38 | Using Differentiation |
| 39 | Tangents and Normals |
| 40 | Maximum and Minimum Points |
| 41 | Increasing and Decreasing Functions |
| 42 | Points of Inflection |
| 43 | The Second Derivative |
| 44 | Applications |
| 45 | The Chain Rule |
|  | **P2: Differentiation** |
| 46 | The Product Rule |
| 47 | The Quotient Rule |
| 48 | Differentiating Natural Logarithms and Exponentials |
| 49 | Differentiating Trigonometrical Functions |
| 50 | Differentiating Functions Defined Implicitly |
| 51 | Parametric Equations |
| 52 | Parametric Differentiation |
|  | **P3: Differential Equations** |
| 53 | Forming Differential Equations from Rates of Change |
| 54 | Solving Differential Equations |
|  | **P1: Integration** |
| 55 | Reversing Differentiation |
| 56 | Finding the Area Under A Curve |
| 57 | Area as The Limit of A Sum |
| 58 | Areas Below the X Axis |
| 59 | The Area Between Tow Curves |
| 60 | The Area Between A Curve and the Y Axis |
| 61 | The Reverse Chain Rule |
| 62 | Improper Integrals |
| 63 | Finding Volumes by Integration |
|  | **P2: Integration** |
| 64 | Integrals Involving The Exponential Function |
| 65 | Integrals Involving The Natural Logarithm Function |
| 66 | Integrals Involving Trigonometrical Functions |
| 67 | Numerical Integration |
|  | **P3: Further Integration** |
| 68 | Integration by Substitution |
| 69 | Integrals Involving Exponentials and Natural Logarithms |
| 70 | Integrals Involving Trigonometrical Function |
| 71 | The Use of Partial Fractions in Integration |
| 72 | Integration by Parts |
| 73 | General Integration |
|  | **P1: Trigonometry** |
| 74 | Trigonometry Background |
| 75 | Trigonometrical Functions |
| 76 | Trigonometrical Functions for Angles of any Size |
| 77 | The sine and cosine Graphs |
| 78 | The tangent graph |
| 79 | Solving Equations using Graphs of Trigonometrical Functions |
| 80 | Circular Measure |
| 81 | The Length of An ARC of A Circle |
| 82 | The Area of A Sector of A Circle |
| 83 | Other Trigonometrical Functions |
|  | **P2: Trigonometry** |
| 84 | Reciprocal Trigonometrical Functions |
| 85 | Compound-Angle Formulae |
| 86 | Double-Angle Formulae |
| 87 | The Forms rcos, rsin |
| 88 | The General Solutions of Trigonometrical Equations |
|  | **P1: Vectors** |
| 89 | Vectors in Two Dimensions |
| 90 | Vectors in Three Dimensions |
| 91 | Vectors Calculations |
| 92 | The Angle Between Two Vectors |
|  | **P3: Vectors** |
| 93 | The Vector Equation of a Line |
| 94 | The Intersection of Two Lines |
| 95 | The Angle Between Two Lines |
| 96 | The Perpendicular Distance from A Point to a Line |
| 97 | The Vector Equation of a Plane |
| 98 | The Intersection of A Line and A Plane |
| 99 | The Distance of A Point from A Plane |
| 100 | The Angle Between A Line and A Plane |
| 101 | The Intersection of Two Planes |
|  | **P2: Logarithms and Exponentials** |
| 102 | Logarithms |
| 103 | Exponential Functions |
| 104 | Modelling Curves |
| 105 | The Natural Logarithm Functions |
| 106 | The Exponential Function |
|  | **P2: Numerical Solution of Equations** |
| 107 | Interval Estimation – Change-of-Sign Methods |
| 108 | Fixed-Point Iteration |
|  | **P3: Complex Numbers** |
| 109 | The Growth of the Number System |
| 110 | Working with Complex Numbers |
| 111 | Representing Complex Numbers Geometrically |
| 112 | Sets of Points in An Argand Diagram |
| 113 | The Modulus-Argument form of Complex Numbers |
| 114 | Sets of Points Using The Polar Form |
| 115 | Working with Complex Numbers in Polar Form |
| 116 | Complex Exponents |
| 117 | Complex Numbers and Equations |

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| **Each Day: 5 Subjects x 3 Topics = 15 Topics** | | |
| 01 | Programming in C | 104 |
|  | Object-Oriented Programming with C++ | 172 |
| 02 | Fundamental of Database System | 190 |
| 03 | Data Structure and Algorithm | 92 |
| 04 | Software Engineering and Maintenance | 241 |
| 05 | Basic Mathematics | 118 |