



### Course description:

The main aim of this course is to introduce the principles and constraints that affect the way programming languages are designed. Linguistic features of several languages are explored and compared for improved design and use of computer languages.

### Aims of the course:

*Students are expected to:*

1. Be familiar with several language paradigms and how they can be effective in different areas of application
2. Have a reasonable understanding of the compromises made in a standard specification of a language in relation to machine independence and efficiency.
3. Appreciate the similarities and differences among various approaches taken by object oriented languages and procedural languages.
4. Be sufficiently familiar with most popular languages and be able to read and understand programs written in some of these languages

### Intended Learning Outcomes (ILOs):

*Upon successful completion of this course, students are expected to:*

#### A. Knowledge and Understanding

##### A1. Concepts and Theories:

1. Gain knowledge and understanding of programming languages.
2. Gain Knowledge and understanding of the history, different design and implementation philosophies used in most of the programming languages.
3. Demonstrate knowledge and understanding of essential facts and concepts in programming languages.
4. Gain knowledge and understanding of the underlying architecture and organization of the programming languages.
5. Understand the relationship and differences between the programming languages
6. Understand the relationship between unstructured programming and structured programming.

##### A2. Contemporary Trends, Problems and Research:

- Review the recent methods and techniques in designing computer programming languages

##### A3. Professional Responsibility: Abide by laws and regulations of software development and design

#### B. Subject-specific skills

##### B1. Problem solving skills:

- Be able to understand and analyze the programming languages design related problems

##### B2. Modeling and Design:

- Be able to design simple programming languages



**B3. Application of Methods and Tools:**

- Be able to use new methods and technique to design new programming languages

**C. Critical-Thinking Skills****C1. Analytic skills:**

- Learn new analytical skills that can help in improving the design of programming languages

**C2. Strategic Thinking:**

- Learn how choose the best programming languages to solve a problem(s) at hand

**C3. Creative thinking and innovation:**

- Be able to understand how design a language that can solve a specific problem

**D. General and Transferable Skills (other skills relevant to employability and personal development)**

D1. *Communication:* Express and communicate ideas in written and oral forms.

D2. *Teamwork and Leadership:* Be cooperative members of a team

D3. *Organizational and Developmental Skills:* Plan, prioritize, and achieve defined goals

D4. *Ethical and Social Responsibility:* Understand that they are accountable for their actions and there must be a balance between economic growth and the welfare of the society and environment.

**Course structures:**

| Week  | Hours | ILOs                                   | Topics  | Teaching Procedure   | Assessment methods         |
|-------|-------|--|---|--|----------------------------|
| 1     | 3     | A1, D4                                 | Introduction: Shows how programming languages fit into the software development process and the effect this has had on language design.   | Lecturing with active participation, quizzes, team learning. | Homework, quizzes, reports |
| 2, 3  | 6     | A1                                     | Historical survey. Provides a historical survey of main programming languages and their development.  | =  | =                          |
| 4, 5  | 6     | A1,A2,A3                               | Types, values and declarations. Deals with variables, types, and declarations. This chapter shows that binding time of languages' types explains many of the differences among programming languages. | =  | =                          |
| 6, 7  | 6     | A1,A2,A3, B1,B2,C1, C2, D1, D2, D3, D4 | Expressions and statements. Deals with expressions and statements with emphasis on structured control statements.   | =  | =                          |
| 8     |       | A1,A2,A3, B1,B2,C1, C2,C3,D1           | Program structure. Shows high-level organization of procedural and object-oriented languages.   | =  | =                          |
| 9, 10 | 6     | A1,A2,A3, B1,B2,C1,                    | Procedures, functions and methods. Looks at procedures and methods with   | =  | =                          |



|                        |   |   |   |   |   |
|------------------------|---|---|---|---|---|
|                        |   | C2,C3,D1,<br>D2,D3, D4                          | particular attention paid to parameter-passing mechanisms.  |   |   |
| 11, 12                 | 3 | A1,A2,A3,<br>B1,B2,C1,<br>C2,C3,D1,<br>D2,D3    | Structured Data: deals with structured data types: arrays, records, classes, strings and sets.                  | = | = |
| 13                     | 3 | A1,A2,A3,<br>B1,B2,C1,<br>C2,C3,D1,<br>D2,D3,D4 | Inheritance and Dynamic binding. Compares the procedural and O.O. in terms of dynamic binding and polymorphism. | = | = |
| 14                     | 3 | A1,A2,A3,<br>B1,B2,C1,<br>C2,C3,D1,<br>D2,D3,D4 | Syntax and semantics. Using BNF form and syntax diagrams and its semantic approaches.                           | = | = |
| <b>15<sup>th</sup></b> |   |   | <b>Final exam</b>   |   |   |

### References:

#### A. Main Textbook:

1. Comparative Programming Languages , L. Wilson-Addison-Wesley

#### B. Supplementary Textbook(s):

1. Principles of Programming Languages, R. Tennent-Prentice Hall
2. Concepts of Programming Languages, Robert W. Sebesta. Addison Wesley
3. Ravi Sethi, "Programming Languages - Concepts and Constructs", Addison-Wesley

### Assessment Methods:

| Methods                               | Grade     | Date                   |
|---------------------------------------|-----------|------------------------|
| <b>1st</b>                            | <b>20</b> | <b>Specified later</b> |
| <b>2<sup>nd</sup></b>                 | <b>20</b> | <b>Specified later</b> |
| <b>Activities &amp; Participation</b> | <b>10</b> |                        |
| <b>Final Exam</b>                     | <b>50</b> |                        |

