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CSEG 3015: Compiler Design

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Course Information

- Course Code: CSEG 3015
- Subject Name: Compiler Design
- Lectures: 3
- No of Credits: 3
- Session: 2020-21 (Jan-May)

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Faculty Information

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Prerequisite

- Formal Language and Automata Theory
- Basic knowledge of Programming Language

Teaching Pedagogy

- Presentation
- Voiceover presentation
- Video Lectures
- Video lectures from web resources

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References

- Text Book
  - Alfred V. Aho, Ravi Sethi Jeffrey D. Ullman, “Compilers- Principles, Techniques, and Tools”, 2nd Edition, Pearson Education Asia
  - Robin Hunter, “The Essence of Compiler”, 2nd Edition, Pearson Publication.

- Reference Book
  - Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers, 2002.
  - Steven S. Muchnick, “Advanced Compiler Design and Implementation, “Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
  - Keith D Cooper and Linda Torczon, “Engineering a Compiler”, Morgan Kaufmann Publishers Elsevier Science, 2004.
  - Charles N. Fischer, Richard. J. LeBlanc, “Crafting a Compiler with C”, Pearson Education, 2008.

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References

- Web Resources
  - https://nptel.ac.in/courses/106/104/106104123/
  - https://nptel.ac.in/courses/106/108/106108052/
  - https://nptel.ac.in/courses/106/108/106108113/

Grading

- Internal Assessment (30%)
  - 2 Quizzes (1 before mid semester and 1 after mid semester)
  - 2 Class tests (1 before mid semester and 1 after mid semester)
  - 2 Assignments (1 before mid semester and 1 after mid semester)
- Mid Semester Examination (20%)
- End Semester Examination (50%)

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Why study Compiler Design

- Compilers is part and parcel of modern computer systems. It acts as an interface between human being and the machine. They are responsible for making the user's computing requirements to be specified as a piece of program which will be understandable to the underlying machine.
- The actual process involved in this transformation is quite complex. Automata Theory provides the base of the course on which several automated tools can be designed to be used at various phases of a compiler.
- This course on compiler design will address all issues, starting from the theoretical foundations to the architectural issues to automated tools.
- The course content is same as current GATE syllabus, so it will enable the students to prepare well for the GATE exam.

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Course Objectives

- To introduce the major concept areas of language translation and compiler design.
- To enrich the knowledge in various phases of compiler and its use, code optimization techniques, machine code generation, and use of symbol table.
- To extend the knowledge of parser by parsing LL parser and LR parser.
- To provide practical programming skills necessary for constructing a compiler.

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Course Outcomes

- Comprehend the different phases of compiler.
- Use the concept of regular grammar to build lexical analyzer.
- Build parser for a context free grammar.
- Synthesize syntax directed translations rules.
- Assess code and memory optimization techniques to improve the performance of a program

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Course Outline

- Introduction to Compilers - Unit 1- No of lectures-2
  - Phases & Passes
  - Bootstrapping
- Lexical Analysis - Unit 1- No of lectures- 3
  - Role
  - Recognition of tokens
  - Fine automata
  - Design of lexical analyzer
- Syntax Analysis - Unit 1- No of lectures- 2
  - Context Free Grammars, its capabilities and applications in syntax analysis
  - Derivation & Parse tree
  - Ambiguity

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Course Outline

- Parsing - Unit 2- No of lectures-1
  - Introduction and its types
- Top Down Parsing - Unit 2- No of lectures-3
  - Operator Precedence grammar and parsing
  - Predictive Parser
- Bottom up Parsing - Unit 2- No of lectures-5
  - Shift reduce parser
  - SLR parser
  - Canonical LR parser
  - LALR parser
- Automatic parser generator - Unit 2- No of lectures-1

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Course Outline

- Intermediate Code Generation - Unit 3- No of lectures-2
  - Syntax Tree
  - Three Address Code
  - Quadruple
  - Triples

- Syntax Directed Translation Scheme - Unit 3- No of lectures-4
  - Attributes definition and evaluation
  - Assignment Statements
  - Boolean Expressions
  - Control Statements

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Course Outline

- Symbol table - Unit 4- No of lectures-2
  - Data structure
  - Scope representation
- Run Time Administration - Unit 4- No of lectures-2
  - Implementation of Simple Stack Allocation Scheme
  - Storage Allocation in Block Structures Language
- Error Handler - Unit 4- No of lectures-2
  - Error Detection and Recovery
  - Lexical, syntactical and semantic phase error

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Course Outline

- Code Optimization - Unit 5- No of lectures-4
  - Types and terminology
  - DAG
- Code Generation - Unit 5- No of lectures-3
  - Issues
  - Peephole optimization
  - Global data flow analysis

THANK YOU

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