Module 00: Course Plan

CS31003: Compilers &

CS39003: Compilers Laboratory

Faculty: Indranil Sengupta and Partha Pratim Das
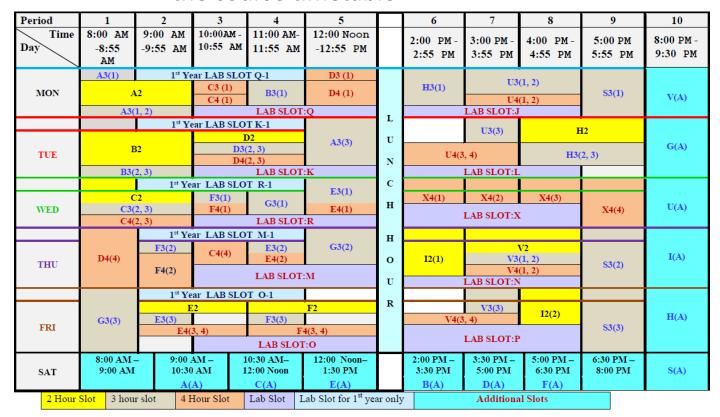
01-Sep-2020

Interactions in the Class

- Kindly keep your microphone muted

- Kindly keep your video off

- Kindly put your comments / doubts on the chat – chats will be periodically checked and responded

- Kindly raise your hand to ask a question

- Deeper interactions / feedback will be over
  - Weekly feedback
  - Forum on Moodle
  - Tutorial Sessions

Time Table Slots

- Slot B3:
  - CS31003: Compilers
  - **MON (11:00 – 11:55)**
  - **TUE (08:00 – 09:55)**
  - *Theory Lectures*

- Slot B(A):
  - CS31003: Compilers
  - **SAT (14:00 – 15:30)**
  - *Theory Lectures*
  - *Tutorial Sessions*

- Slot N:
  - CS39003: Compilers Laboratory
  - **THR (14:00 – 16:55)**
  - *Laboratory Lectures*
  - *Laboratory Interactions*
  - *Tutorial Sessions*

- Based on the schedule, some slots may be used for other purposes too – details given in the course timetable

Team of Tutors (Faculty + TA)

TAs: If your mail and / or mobile / WhatsApp number

#	Faculty Name	Institute Email	Personal Mail	Mobile
1	Partha Praim Das	ppd@cse.iitkgp.ac.in	partha.p.das@gmail.com	9830030880
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9	Srijoni Majumdar	15AT92R01	srijoni.majumdar@iitkgp.ac.in	majumdar.srijoni@gmail.com	9674474267

Lecture Session

- # Sessions: 21
- Duration: 1, 1.5 or 2 hours
- Total Hours: 32
- Students / Session: All (both sections)
- Every Session
  - Presented by Faculty
  - On Microsoft Teams
  - Deals with:
    - Elucidates translation theory
    - Outlines translation in practice
  - Video
    - Available on YouTube

- Lectures & Presentations
  - Organized in Modules
  - Available on Moodle
- Lectures to be conducted
  - Slot B3
  - Slot B(A) – on select days
- Weekly Feedback
  - For all lectures of the week
  - Used for doubt clearing / in Tutorial
- In-Lecture Quiz
  - Short quiz in the middle of the lecture
  - On selective lectures
  - Conducted on surprise

Lecture Session: Modules

Module #	Module Topic	Hours
Module 00 – Plan	Course Plan	1
Module 01 – Phases	Phases of a Compiler	2.5
Module 02 – Flex	Lexical Analysis, Flex Specs. and Tool	3
Module 03 – Parsing	Top-down & LR Parsing	6
Module 04 – Bison	Bison Specs. and Tool	1
Module 05 – IC Translation	Intermediate Code Translation	8
Module 06 – RTE	Run-time Environment (in Lab)	0
Module 07 – TC Generation	Target Code Generation	2.5
Module 08 – Local Opt	CFG & Local Optimization	2
Module 09 – DFA	Data Flow Analysis	2
Module 10 – Code Generator	Code Generator	1
Module 11 – Reg. Alloc.	Global Register Allocation	1
Module 12 – Loop Opt	Loop Optimization	1
Module 13 – Summarization	Summarization	1
Total		**32**

Tutorial Session

- Tutorial Sessions: 7
- Duration: 1.5 hours
- Total Hours: 10.5
- Students / Session: ~20
- Parallel Sessions: 6
- Every Session
  - Driven by Tutor (Faculty or TA)
  - Deals with:
    - Doubt clearing on theory and assignment
    - Review of Solved Problems from theory
    - Solve new problems from theory
    - Minor extensions to theory
    - Solve problems on extension of theory
    - Model Solutions of TAs

- Sessions:
  - **TS-1**: Lexical Analysis and Flex Specs. (**M-02**)
  - **TS-2**: Parsing: Recursive Descent & LR (**M-03**)
  - **TS-3**: Bison Specs. (**M-04**)
  - **TS-4**: Intermediate Code Translation (**M-05**):
    - Arithmetic Expressions
  - **TS-5**: Intermediate Code Translation (**M-05**):
    - Boolean Expressions & Control Constructs
  - **TS-6**: Target Code Generation (**M-06**, **M-07**)
  - **TS-7**: CFG & Local Opt. DFA (**M-08**, **M-09**)

Evaluation: Theory

- Continuous Evaluation:
  - TA: Theory Assignments (asynchronous) (Questions per Assignment: 2 to 3)
  - CQ: Class Quiz (synchronous)
  - TQ: Theory Quiz (synchronous) (Questions per Quiz: 12 to 15)
  - Marking:
    - 4-5 TA * 10 = 40~50
    - CQ = 10~20
    - 2 TQ * 20 = 40

- Assignments (TA)
  - Marks: 10
  - Number of TAs: 6 – 8
  - Best 4~5 to be used
  - Mode of TA: *Using Assignment Activity on Moodle*
    - On Paper – Handwritten, scanned and uploaded to Moodle
    - Open-book, Open-notes natured

- In-Class Quiz (CQ)
  - Marks: 10~20
  - Conducted within class period by surprise

- Quiz (TQ)
  - Marks: 20
  - Time: 1 hr.
  - Total Number of TQs: 3
  - Best 2 to be used
  - Mode of TQ
    - On Moodle – Synchronous – Auto evaluated
    - Use Quiz Activity on Moodle
    - Use several Question Types (MCQ, MSQ, SA, List-Match)
    - Shuffles the Presentation of questions
      - Students get the same set of questions but in different order
      - When student A is doing Question X, student B is doing Question Y. Eventually student A also gets Question Y and student B gets Question X
    - Shuffles the Options in MCQ / MSQ
    - No revisit of a question
    - Conducted during Slot N (timetable)

Evaluation: Theory

- Theory Assignments (TA)
  - **TA-1**: Phases (**M-01**)
  - **TA-2**: Lexical Analysis (**M-02**)
  - **TA-3**: Parsing (**M-03**)
  - **TA-4**: Symbol Table (**M-05**)
  - **TA-5**: IC Translation (*Expression*) (**M-05**)
  - **TA-6**: IC Translation (*Control*) (**M-05**)
  - **TA-7**: TC Generation (**M-07**)
  - **TA-8**: CFG & Code Generation (**M-08**, **M-10**)

- Theory Quiz (TQ)
  - **TQ-1**: Phases + LA + Parsing (**M-01**, **M-02**, **M-03**)
  - **TQ-2**: IC Trans (**M-05**)
  - **TQ-3**: TC Gen + CFG + DFA (**M-07**, **M-08**, **M-09**)

- Class Quiz (CQ)

Laboratory Session

- Lab Sessions: 8
- Duration: 3 hours
- Total Hours: 24
- Students / Session: All
- Every Session
  - Driven by Tutor (Faculty or TA)
  - Deals with:
    - Lab-specific theory
    - Explain to start an LA
    - Discuss and close an LA

- Infra:
  - Language: C++
  - Platform:
    - Linux - Any stable release. If using Ubuntu, avoid 18.04. Using 16.04 is better
  - Tools:
    - GNU – GCC: Preferably any version > 8.0.0
    - Flex: Variants of 2.5.x, 2.6.x
    - Bison: Preferably variants of 3.x.x. However, 2.x.x will also do
    - An example combination: Ubuntu 16.04. gcc 8.3.0. flex 2.6.0, Bison 3.0.4
  - Target Language: tinyC
  - Target Architecture: x86-64

Evaluation: Laboratory

- Laboratory Tasks:
  - LQ: Quiz (synchronous) (Questions per Quiz: 8 to 12)
  - LA: Assignments (asynchronous)
  - Marking:
    - 2 LQ * 15 = 30
    - 6 LA = 5 + 5 + 10 + 10 + 20 + 20 = 70
- Quiz (LQ)
  - Marks: 15
  - Time: 1hr.
  - Total Number of LQs: 3
  - Best 2 to be used
  - Mode of Quiz
    - Like TQ

- Assignments (LA)
  - Marks: Variable
  - Number of LAs: 6
  - Mode of Assignment
    - On Moodle
    - Use Assignment Activity on Moodle
  - Submit Assignment
    - Source files
    - README with terminal commands
    - To run on Linux OS only
  - Viva on selective assignments

Evaluation: Laboratory

- Assignments (LA)
  - **LA-1**: Annotate x86-64 Assembly [5]
  - **LA-2**: Library in x86-32 Assembly [5]
  - **LA-3**: Lexical Analyzer for tinyC [10]
  - **LA-4**: Parser for tinyC [10]
  - **LA-5**: TAC Generator for tinyC [20]
  - **LA-6**: x86 Code Generator for tinyC [20]
  - Task Balance
    - **LA-1 – LA-4**: *Individual*
    - **LA-5 – LA-6**: *Group of 2*

- Quiz (LQ)
  - **LQ-1**: Flex
  - **LQ-2**: Bison
  - **LQ-3**: Symbol Table

Platforms & Tools

- Interaction Platforms
  - Microsoft Teams
    - Class Lectures
    - Tutorial
    - Lab Lectures & Interactions
  - YouTube
    - Videos

- Plagiarism Checker Tool
  - MOSS Code Generation Plagiarism Checker

- LMS Platform
  - Moodle
    - Announcements
    - Course Information, Tracking
    - Content Sharing
    - TA and LA Management
      - Assignment Start, Submission & Close
    - Conduct TQ and LQ
      - Explore Quiz Online
      - Explore Question Types
    - Forum for Interactions
    - Student Key
      - Compiler Theory: **sTU_THEORY1**
      - Compiler Lab: **sTU_LAB1**

Plagiarism

- Zero tolerance to plagiarized submissions
- Both (copied from and copied by) are equally penalized with zero credit

Q & A

ISG & PPD