DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPALLI
SEMESTER-3 GUIDELINES BY PRAJWAL SUNDAR

A. Courses

Programme Core Courses

CSPC31	Principles of Programming Languages	4 credits
CSPC32	Data Structures and Algorithms	3 credits
CSPC33	Digital System and Design	3 credits
CSPC34	Computer Organization	3 credits

Laboratory Courses

CSLR31	Data Structures Laboratory	2 credits
CSLR32	Digital Systems Laboratory	2 credits

Institute Requirement Course

MAIR31	Probability and Operational Research	4 credits

Programme Electives

CSPE32	Combinatorics and Graph Theory	3 credits

Total Credits = (4+3+3+3) + (2+2) + (4) + (3) = 13 + 4 + 4 + 3 = **24 credits**

B. Guide for studying elective: Combinatorics and Graph Theory

- Combinatorics: This is majorly a complete in-depth study of your JEE Mathematics chapter, famously known for its difficulty – *Permutations and Combinations*. Before beginning this course, I recommend each and every one of you to take your JEE coaching material, and study *each and every nook and corner* of this chapter, till JEE advanced level. Focus on *derivations* – many of them will come in this course. Once you have finished JEE, open the PPTs and study content provided by your professor, and you will see that most of the syllabus has already been covered – only very *few* topics will be new.
  Good Playlist: Watch any good playlist on *YouTube*
  My recommendation: Combinatorics by Jay Bansal

- Graph Theory: Basic introduction to graph theory would have already been given in the Discrete Structures course offered in the previous semester. The best way to ace this course is to *avoid mugging* and getting a *complete understanding* of each and every concept and theorem. But, please note that sometimes, you might have to mug derivations to get marks, and this might be a bit hard, but please do so.
  Good Playlist: Watch any good playlist on *YouTube*
  My recommendation: Graph Theory by Amit Khurana

  [My PDFs and notes attached]

C. Guide to study programme core courses

- Principles of Programming Languages (PPL): This course is designed to give you a flavour of all languages. It consists of a lot of theory and concepts, and requires a lot of effort. It might be irritating and dry, but please remember that this is a very important course, and will help you in your future semesters a lot (the course named *Compilers* in semester6 is a detailed expansion of what you learnt in ECS in Sem2 and PPL in Sem3, so study these courses properly). Practice a lot, and mug all points given in the PowerPoint presentations to get a good grade.

  [my PDFs are attached]

- Data Structures and Algorithms (DSA): Not concentrating on this course is like not concentrating on how to add 2 numbers in LKG. This is the *MOST IMPORTANT COURSE OF YOUR CSE LIFE JOURNEY*. The concepts you study here will get you *high-paying internships* and *job-offers*. Give your MAXIMUM TIME to this course. There is no harm if you study the same concept from multiple sources, but ensure you get all concepts into your head firmly. Ensure you go through ALL the following playlists properly (keep your syllabus side-by-side and go through only ones in your syllabus):
  Data Structures Jenny's Lectures (many videos here overlap with some portions of Algorithms Course (CSPC42) and Advanced DSA (CSPE43) – no harm in studying these now itself, but you can refer those syllabi and omit them for now if you want to study them later on)
  Data Structures Neso Academy
  Data Structures WilliamFiest
  Data Structures Striver Playlist (completing this playlist and being able to solve high-level DSA questions will guarantee you an internship and a job in a well-reputed company) – for this semester, this might not be that necessary – but you can try watching some basic videos under each topic to grasp the concept.

  [textbook KARUNMANCHI is attached – have a thorough study of this book]

- Digital Systems and Design (DSD): This is a course wherein you will be exposed to the fancy world of digital logic. You will be exposed to a lot of 0's and 1's and many logic gates, and how we can construct complex gates from simple gates. To ace this course, please go through the standard *Moris Mano* textbook and also the following playlists:
  Neso Academy – Digital Electronics – Neso Academy
  Tutorials Point – Digital Electronics – Tutorials Point
  Gate Smashers – Digital Logic – Gate Smashers

  [textbook MORIS MANO is attached – have a thorough study of this book]

- Computer Organization (CO): This is a very interesting course. Most of the concepts can be understood once adequate time is spent on learning the concept. Only a little bit of theory and a few diagrams need to be remembered, which isn't that difficult. Learn how to translate code into various formats

(MIPS, Machine Code OPS). Also master the concept of pipelining properly (the same concept will reappear in Sem5 under the course named Computer Architecture, so ensure you learn this thoroughly and do not forget it after this semester). The key to acing this course is by *learning all concepts*, then *mugging all theory*, and most importantly, *solving all book-back questions* without exception. This will easily guarantee a good grade.
Neso Academy Playlist: Computer Organization & Architecture - Neso Academy
Gate Smashers Playlist: Computer Organization & Architecture - Gate Smashers

[my PDFs and the textbook CO by David A Patterson and John L. Hennessy are attached]

D. Guide for laboratory courses

- Data Structures Laboratory: Some professors disclose questions beforehand, so if that is the case, please prepare and then go to the lab. Others give on the spot questions – if this is the case, ensure you have studied the concept thoroughly and done at least 15 to 20 *leetcode questions* on that concept. At any case, *do not waste precious time in the laboratory*. Make full use of the time provided. Make sure to follow a strict discipline of completing the lab record on the same day as the lab is completed.
  Languages: Purely C and C++ will be used (depends on your professor). Ensure you master these languages from standard tutorials – they will be very important for internships and placements also.
  [my codes are attached as a folder]

- Digital Systems Laboratory: This is one of the most enjoyable labs (all hardware labs are personally interesting to me) – where you will be practically *realizing* and *building* circuits what you draw in the theory course. Use the first 2 labs effectively to build simple circuits (like XOR gate), and understand the connections and working of the laboratory devices. Once you get a grasp of the mechanisms, you will be able to construct ANY circuit, when circuit diagram is provided to you – if you reach this state, then you are safe. Note the differences between combinational and sequential circuits – combinational circuits are simple to understand, but sequential circuits require a bit more understanding and a bit more of hardware to operate (flip flops and clocks). At the end, you will also be made to *code in Verilog*. Enjoy your time here, you will miss it later!

E. Guide for Mathematics Course: Probability and Operational Research

- Probability: Before jumping into this course, please ensure you have *thoroughly* studied *JEE Advanced Probability* concepts, as similar model concepts will be covered in this course. Also, have a complete revision of the concept of *area under the curve* – both what you studied during JEE as well as new concepts covered in Semester1 (concepts of double and triple integrations). Once these pre-requisites are met, it will be easy for you to grasp concepts covered here. The key to acing this subject is *understanding* – do not try to memorize any formula without understanding it, as it will only help you in the short run.

Practice as many questions as you can, to get a good grasp. Till now, you would have been exposed only to probability in one dimension – but here, you will be exploring multi-dimensional probability as well. Study well, and have fun here!

Refer notes, and good YouTube playlists.

A good playlist: Probability and Statics Gate Smashers

Another good playlist: Probability by HV Sir

- Operational Research: Math lovers, halt – this is not the mathematics you would generally love (at least for me).

  Well, first of all, this is an extension of the concept of *linear regression* and *optimizing functions based on given conditions* (you have to draw all lines, and find values at corner points to optimize – you might have most probably done this in your school time / JEE, if not, go through this topic once before coming here).

  This whole subject is dedicated to how to solve the same situation in various concepts *without using graphs*, as graphs restrict you to 2 (or 3) dimensions, and you cannot visualize higher dimensions. You will have to construct an infinite number of tables, keep performing *row and column operations* (refer row and column operations you did in JEE Matrices and Determinants chapter). You need to remember conditions as to when to stop, how to stop, and so on – please *have a good memory* and *memorize*. Also, *develop lots of patience* to solve these questions – they might drain a hell lot of energy from you.

  Very useful website (use it to *check* your steps, do not directly copy from here, else you will become lazy and you will not be able to complete the question paper, be it in a CT or End-Semester): Online Operational Research Calculators

  Watch any good playlist on YouTube.

  Basic Playlist: Operations Research by Gajendra Purohit

  Highly advanced Playlist: Operations Research NPTEL IIT Roorkie

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Dear Juniors,

With this, I would like to conclude the document. I wish you all the best for your 3rd semester [and the upcoming semesters]. This is the first semester wherein you will be completely immersed into your department core courses – so take this semester seriously and aim for a good CPGA. For any issues, feel free to contact me anytime [my number: +917010460164]. I prefer introduction via text and if needed, you can also call anytime. Once again, all the best!
