

## COURSE TEMPLATE

|    |                                                      |                                  |
|----|------------------------------------------------------|----------------------------------|
| 1. | <b>Department/Centre proposing the course</b>        | CSE                              |
| 2. | <b>Course Title</b><br>( <i>&lt; 45 characters</i> ) | INTRODUCTION TO COMPUTER SCIENCE |
| 3. | <b>L-T-P structure</b>                               | 3-0-2                            |
| 4. | <b>Credits</b>                                       | 4                                |
| 5. | <b>Course number</b>                                 | CSL104                           |
| 6. | <b>Status</b><br>( <i>category for program</i> )     | UG                               |

  

|    |                                                      |                                         |
|----|------------------------------------------------------|-----------------------------------------|
| 7. | <b>Pre-requisites</b><br>( <i>course no./title</i> ) | Basic Knowledge of Computers or CSP 100 |
|----|------------------------------------------------------|-----------------------------------------|

  

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|-----|---------------------------------------------------------------------------|---------------|
| 8.  | <b>Status vis-à-vis other courses</b> ( <i>give course number/title</i> ) |               |
| 8.1 | Overlap with any UG/PG course of the Dept./Centre                         | CSL101/CSL102 |
| 8.2 | Overlap with any UG/PG course of other Dept./Centre                       | None          |
| 8.3 | Supercedes any existing course                                            | CSL101/CSL102 |

  

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|----|-------------------------------------------------------------|--|
| 9. | <b>Not allowed for</b><br>( <i>indicate program names</i> ) |  |
|----|-------------------------------------------------------------|--|

  

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|-----|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10. | <b>Frequency of offering</b> | <input checked="" type="checkbox"/> Every sem <input type="checkbox"/> 1 <sup>st</sup> sem <input type="checkbox"/> 2 <sup>nd</sup> sem <input type="checkbox"/> Either sem |
|-----|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

  

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| 11. | <b>Faculty who will teach the course</b><br>Multiple faculty members may be assigned. This is a first year course. |  |
|-----|--------------------------------------------------------------------------------------------------------------------|--|

  

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| 12. | <b>Will the course require any visiting faculty?</b> | NO |
|-----|------------------------------------------------------|----|

  

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|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 13. | <b>Course objective</b> ( <i>about 50 words</i> ):<br>Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs. |  |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

  

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| 14. | <b>Course contents</b> ( <i>about 100 words</i> ) ( <i>Include laboratory/design activities</i> ):<br>Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement. Iterative versus recursive style; problem solving using a functional style; correctness issues in programming; efficiency issues in programming; time and space measures. Structured style of imperative programming; Assertions and loop invariants; programming in an imperative language using advanced features: procedures, functions. Data types, representational invariants. Encapsulation, abstractions, interaction, modularity. Identifying and exploiting inherent concurrency. |  |
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Dept.: COMP. SC. ENGG.

04 FEB 2013

Ref. No.: 20.....13.....BCSE.....307.....

**15. Lecture Outline** (with topics and number of lectures)

| Module no.                  | Topic                                                                                                                                                                                                                                                                                                                                                                                             | No. of hours |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 1                           | <ul style="list-style-type: none"> <li>Models of computation. The stored program model.</li> <li>Mathematical preliminaries</li> <li>Computer Organization and Basic Principles of Operation</li> <li>A functional model of computation</li> <li>The primitive expressions</li> <li>Substitution of functions and variable binding</li> <li>Definition of functions using conditionals</li> </ul> | 4            |
| 2                           | <ul style="list-style-type: none"> <li>Functions as inductively defined computational processes</li> <li>Recursive processes</li> <li>Analysis of correctness and efficiency</li> <li>Tail-recursion and iterative processes</li> <li>Correctness of an iterative process</li> <li>Examples of iterative processes</li> </ul>                                                                     | 4            |
| 3                           | <ul style="list-style-type: none"> <li>Analysis of correctness and efficiency</li> <li>Correctness</li> <li>Efficiency</li> <li>Efficiency, Why and How?</li> <li>In the long run: Asymptotic analysis and Orders of growth</li> <li>More examples of recursive algorithms</li> </ul>                                                                                                             | 4            |
| 4                           | The Imperative model of computation <ul style="list-style-type: none"> <li>The primitives for the imperative model</li> <li>Variables and the assignment instruction</li> <li>Assertions</li> <li>The if then else instruction and The while do instruction</li> <li>Functions and procedures in the imperative models</li> <li>Step-wise refinement and Procedural Abstraction</li> </ul>        | 5            |
| 5                           | Linear Data Structures:<br>Lists, Arrays, Strings<br>Sequence Operations,<br>Searching & Sorting                                                                                                                                                                                                                                                                                                  | 8            |
| 6                           | Executable specifications and rapid-prototyping <ul style="list-style-type: none"> <li>Examples of step-wise refinement</li> <li>Abstraction using higher-order functions</li> <li>Functions as input parameters</li> </ul>                                                                                                                                                                       | 6            |
| 7                           | Encapsulation, abstractions, interaction, modularity and Objects.                                                                                                                                                                                                                                                                                                                                 | 6            |
| 8                           | Identifying and exploiting inherent concurrency. Concurrency and Multithreaded computations                                                                                                                                                                                                                                                                                                       | 5            |
| 9                           |                                                                                                                                                                                                                                                                                                                                                                                                   |              |
| 10                          |                                                                                                                                                                                                                                                                                                                                                                                                   |              |
| 11                          |                                                                                                                                                                                                                                                                                                                                                                                                   |              |
| 12                          |                                                                                                                                                                                                                                                                                                                                                                                                   |              |
| COURSE TOTAL (14 times 'L') |                                                                                                                                                                                                                                                                                                                                                                                                   | 42           |

**16. Brief description of tutorial activities**

NA

**17. Brief description of laboratory activities**

| Module no.                  | Experiment description                                                                 | No. of hours |
|-----------------------------|----------------------------------------------------------------------------------------|--------------|
| 1                           | Multiple Programming Assignments of varying difficulty will be given on topics such as | 4            |
| 2                           | -- Numerical Computations                                                              | 4            |
| 3                           | -- Working with Linear data structures -- lists and strings                            | 4            |
| 4                           | -- Searching & Sorting                                                                 | 4            |
| 5                           | -- Multi-objective search                                                              | 6            |
| 6                           | -- Concurrent processes --- a sample multithreaded program                             | 6            |
| 7                           |                                                                                        |              |
| 8                           |                                                                                        |              |
| 9                           |                                                                                        |              |
| 10                          |                                                                                        |              |
| COURSE TOTAL (14 times 'P') |                                                                                        | 28           |

**18. Suggested texts and reference materials**

STYLE: Author name and initials, Title, Edition, Publisher, Year.

- 1, Subashish Banerjee, Lecture Notes in Computer Science, 2011
2. Python Programming: An Introduction to Computer Science by John Zelle. or suitable language reference depending on Language used for instruction (Python/SML/OCAML/Haskell/etc)
3. How to solve it by Computer by R. J. Dromey, Prentice-Hall India EEE Series.

**19. Resources required for the course** (*itemized & student access requirements, if any*)

|      |                               |                                         |
|------|-------------------------------|-----------------------------------------|
| 19.1 | Software                      | Python, OCAML Interpreters              |
| 19.2 | Hardware                      | Computer Terminals for All Students     |
| 19.3 | Teaching aides (videos, etc.) |                                         |
| 19.4 | Laboratory                    | Computer Centre/First Year Teaching Lab |
| 19.5 | Equipment                     |                                         |
| 19.6 | Classroom infrastructure      | Classrooms for students                 |
| 19.7 | Site visits                   | None                                    |

**20. Design content of the course** (*Percent of student time with examples, if possible*)

|      |                            |     |
|------|----------------------------|-----|
| 20.1 | Design-type problems       | 20% |
| 20.2 | Open-ended problems        |     |
| 20.3 | Project-type activity      |     |
| 20.4 | Open-ended laboratory work |     |
| 20.5 | Others (please specify)    |     |

Date: Feb 4, 2013

(Signature of the Head of the Department)