# SYLLABUS FOR CNC MACHINE TECHNOLOGY (CAD-CAM)

1. **Blue print reading**
   - Reading the machining sketches
   - Different Geometrical tolerance symbols
   - Reading Dimensional Tolerance
   - Understating the view
   - Concept of First angle and Third angle

2. **Conventional Lathe Awareness**
   - Introduction to lathe & its parts
   - Different operation of lathe
   - Centering & facing
   - Drilling
   - Step turning
   - Job setting by dialing
   - Turning in between center
   - Selection of speed, feed and cutting tool

3. **Conventional Milling Awareness**
   - Introduction to milling machine & its parts
   - Different operation of milling
   - Plain milling
   - Step milling
   - Co-ordinate milling
   - Job setting in vice by dialing
   - Job setting on bed with clamps
   - Knowledge of different cutting tools material used

4. **CNC Lathe**
   - Fundamental of CNC lathe
   - Familiarization of Control panel
   - Canned Cycle
   - Work piece setting method
   - Tool setting method
   - Programming by using multiple tools
   - Advance programming techniques
   - Practice on CNC lathe
   - Practice session at industry

5. **Auto Cad**
   - Introduction to Auto Cad
   - Creating Text and table
   - Basic Dimensioning Geometric dimensioning and tolerance
   - Dimension styles and system variable
   - Hatching Drawing

6. **CATIA**
   - Introduction to CATIA
   - Drawing sketches in workbench
   - Constraining sketches
   - Reference element & sketch base feature
   - Advance modeling
   - Wire frame & surface design
   - Assembly modeling
   - Sheet Metal
   - Industrial Component Practice

**Department:** Mechanical, Electrical, Electronics & Civil Engg. (UG)

**Course Title: -** SOLAR ENERGY TECHNOLOGY & SYSTEMS

**Duration: -** Two Week (30hrs Theory & 30 hrs Practical)

**Venue:-** Solar Innovation Lab, Mech. Dept., NKOCET

| Day | Name of Topic | No. of Hours | Name of Practical | No. of Hours |
|---|---|---|---|---|
| 1 | Introduction to world energy scenario, Renewable energy resources | 1 | Solar radiation measurement-Lux meter | 2 |
| | Introduction to Solar energy, Solar Radiation, Types of solar radiation | 2 | | |
| 2 | Solar radiation measurements & Radiation measuring instruments | 3 | Demo on solar radiation Measurement-Pyranometer | 2 |
| | Solar thermal technology , Introduction to thermal systems , Importance of solar tracking systems | | | |
| 3 | Solar Water Heaters (SWH): - Basic working principle of solar hot water system – copper flat plate & Evacuated tube collectors (ETC) - Parts of a SWH & criticality. Installation guidelines | 2 | Trial on solar water heater | 3 |
| 4 | Solar cooker: -Basic working principle - Designs available in the market , Different types of Solar Cookers used in India | 2 | Demo on solar cooker | 3 |
| 5 | Solar dryer- construction, working, Installation & maintains | 2 | Demo on solar dryer | 3 |
| | Design of solar dryer, | | | |
| 6 | Solar distillation- construction, working | 2 | Demo Solar PV Chamber | 3 |
| | Solar PV Chamber | | | |
| 7 | Introduction to solar PV technician, Solar Photovoltaic, Electricity basics, | 03 | Study of solar photovoltaic cell & solar photovoltaic module | 2 |

| | | | | |
|---|---|---|---|---|
| 8 | Fundamental of earthing system , Commercially available solar material technologies | 2 | Type of photovoltaic cell & type and size of solar PV module | 2 |
| | PV module, Fundamental types of modules and its applications,<br>PV components and configuration etc. | 1 | | |
| 9 | Types of solar photovoltaic system System components & inspection ,Site layout & marking , PV System Sizing series & parallel, Fundamental, temperature coefficients of current, voltage and power fundamental | 2 | Study of solar photovoltaic systems | 3 |
| 10 | Most common types of commercially available PV products and systems, Construction of cable trenches & conduits<br>b. Cable tray support & tray erection | 2 | Cable tray support & tray erection requirement& use of tools & tackles | 3 |
| | c. Requirements & uses of tools & tackles | | | |
| 11 | Battery, types of battery, Installation of battery, Design & Selection of Charge controller, Battery | 3 | Study of Installation of battery | 2 |
| 12 | Solar sensible energy storing materials Solar latent heat storing materials | 3 | Demo on solar system with energy storing materials | 2 |

**Prof. C. V. Papade** **Dr. S. S. Metan** **Dr. J. B. Dafedar**

**Course Coordinator** **HOD, Mech.** **Principal**

# Syllabus recommended by
# Dassault Systèmes Foundation

# C++ for Scientific Application Development

**SESSION 1**

COMPUTING FUNDAMENTALS

1. How a data value is represented using binary symbols?
2. Introduction to numbering system
   - 2.1. Decimal
   - 2.2. Binary
   - 2.3. Hexadecimal
   - 2.4. Octal

**SESSION 2**

3. Introduction to computing jargons
   - 3.1. Nibble, Bit, Byte, Word, double word
   - 3.2. KB, MB, GB etc.
4. What are the major building blocks of a computer system?

SEQUENTIAL STRUCTURE

5. Keywords
6. Data Types
7. Classes of Data
   - 7.1. Variables
   - 7.2. Constants

**SESSION 3**

8. Arithmetic Operators
9. Expressions
   - 9.1. Evaluation of an Expression

**SESSION 4**

10. Assignment Statements
    - 10.1. Increment and Decrement Operators
    - 10.2. Compound Assignment Operators
11. Nested Assignments Input and Output
    - 11.1. Introduction to printf and scanf functions
    - 11.2. Using cin and cout

**SESSION 5**

12. Type Conversion
    - 12.1. Automatic Type Conversion
    - 12.2. Explicit Type Conversion
13. Comments
    - 13.1. Introduction to single / multi line comments
    - 13.2. Application of comments

**SESSION 6**

SELECTIVE STRUCTURE

14. Relational Operators
16. Precedence and Associativity
    16.1. Logical Operators
    16.2. Logical AND Operator
    16.3. Logical OR Operator
    16.4. Logical NOT Operator
    16.5. Precedence and Associativity
    16.6. Evaluation of Logical Expression
17. Conditional Expression Operator

**SESSION 7**

18. Conditional Statements
    18.1. if statement
    18.2. if-else statement
19. Nested Conditional Statement
    19.1. Sequence of Nested ifs
    19.2. Dangling else Problem

**SESSION 8**

20. Multi-way Conditional Statement
21. Constant Multi-way Conditional Statement

**SESSION 9**

REPETITIVE STRUCTURE

22. while Loop
    22.1. Infinite Loop
23. do-while Loop
24. for Loop
25. Nested Loops

**SESSION 10**

26. Loop Interruption
    26.1. continue
    26.2. break
27. Null Statement
28. Comma Operator

**SESSION 11**

INTRODUCTION TO MACROS

29. Simple Macros
    - 29.1. Macro Variable
    - 29.2. Macro Function

ARRAYS

30. Basics of Arrays
    - 30.1. Array Declaration
    - 30.2. Accessing Array Elements
    - 30.3. Array Initialization
31. Single dimension, multi dimension

**SESSION 12**

FUNCTIONS

34. Introduction to function
    - 34.1. Function declaration / prototypes
    - 34.2. Function definition
    - 34.3. Function call
    - 34.4. return statement
35. Block structure

**SESSION 13, 14**

36. Storage classes
    - 36.1. Automatic variables
    - 36.2. Static variables
37. External variables

**SESSION 15**

38. Arrays and functions
    - 38.1. Passing Array Element as Arguments
    - 38.2. Passing Array as Argument
39. Resolving name conflict between extern and local identifier using scope resolution operator (::)

**SESSION 16**

40. Function overloading
    - 40.1. Introduction to function overloading
    - 40.2. Rules for function overloading
41. Introduction to name mangling / name decoration

**SESSION 17**

42. Introduction to inline functions
43. Default arguments
44. Recursive functions

**SESSION 18, 19**

POINTERS

49. Basics of Pointers
    - 49.1. Address and Dereference Operators
    - 49.2. Pointer Type Declaration
    - 49.3. Pointer Assignment

49.4. Pointer Initialization
49.5. Pointer Arithmetic
49.6. Precedence of Address and Dereferencing Operators
49.7. Pointer Comparison
49.8. Pointer Conversion

**SESSION 20**

50. Function and pointers
    50.1. Passing argument by value
    50.2. Passing argument by address

**SESSION 21**

51. Arrays and pointers
    51.1. Array as Function Argument
52. Strings and Pointers
    52.1. Library Functions for Processing Strings

**SESSION 22**

53. Pointer Array
    53.1. Command Line Arguments
54. Pointers to Pointer
55. Pointers to Functions

**SESSION 23**

56. Dynamic Memory Management
    56.1. Using new and delete
57. Use same form of new and delete

**SESSION 24**

REFERENCES

60. Introduction to references
61. Passing argument by reference
62. Returning a reference
63. Reference to a pointer
64. Reference to a reference

**SESSION 25, 26**

STRUCTURES

66. Basics of Structures
    66.1. Structure Variables
    66.2. Structure Initialization
    66.3. Accessing Structure Members
    66.4. Structure Assignment
    66.5. sizeof a Structure
    66.6. Nested Structures
    66.7. Pointers to Structures
67. Structures and Functions
    67.1. Scope of a Structure Type Definition
    67.2. Structures as Function Arguments
    67.3. Structures as Function Values

**SESSION 27**

69. Structures and Arrays
    69.1. Arrays of Structures
    69.2. Structures Containing Arrays

**SESSION 28**

70. Pointer to structures
    70.1. Dynamically allocating structure
71. Structures Containing Pointers
    71.1. Self-Referential Structures

**SESSION 29**

CLASSES AND OBJECTS

72. The class
73. Class members:
    73.1. data members
    73.2. function members
74. Access Specifiers
    74.1. public
    74.2. private
75. The 'this' pointer
    75.1. Accessors (Getters) and Mutators (Setters)
76. Constructor

**SESSION 30, 31**

77. Initialization list
78. Constant data members
79. Working with outline form of class
80. Resolving name conflict between function parameter and data member
81. Constant functions
82. Friend functions

**SESSION 32**

NAMESPACES

83. Basic introduction to the feature
    83.1. Using statement
    83.2. std namespace

CLASSES AND OBJECTS - CONTINUED

84. Using and releasing resources
85. Destructor
86. Operator overloading

**SESSION 33**

87. Shallow copy vs deep copy
88. Static members

**SESSION 34**

89. Introduction to containment, composition and aggregation
    89.1. Constructor / destructor order
    89.2. Accessing members of associated class
    89.3. Which members are accessible?

**SESSION 35, 36**

INHERITANCE

90. Introduction to a derived class
    90.1. Constructor / destructor order
    90.2. Base Initializer List
    90.3. Visibility of inherited members
    90.4. protected access specifier
91. Multilevel Inheritance

**SESSION 37**

92. Accessing base members from within derived class members
93. Discussion on why is it allowed for parent pointer to point to child object but no other way round?
94. Object slicing

**SESSION 38**

POLYMORPHISM

95. Introduction to polymorphism
    95.1. Overriding function
96. Introduction to pure virtual function
97. Virtual destructor functions

**SESSION 39**

98. Introduction to abstract base classes
99. Introduction to interface

EXCEPTION HANDLING

106. Introduction to Exception Handling
    106.1. try, catch and throw

**SESSION 40**

CHARACTERISTICS OF OOP

107. Introduction to
    107.1. Abstraction
    107.2. Encapsulation
    107.3. Inheritance
    107.4. Polymorphism
    107.5. Messages

PROCESSORS

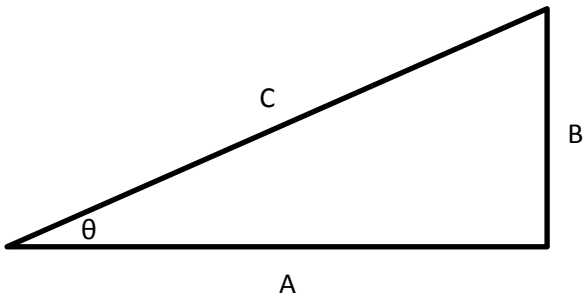
100. Application of #if, #ifndef, #ifdef, #else, #elif, #endif, #pragma once
101. Two usage of #include

MISCELLANEOUS

108. Introduction to enumeration. Introduction to shared and static library

# Assignment examples
# For
# C++ for Scientific Application Development

1. Following figure shows a right triangle with a hypotenuse of length C and angle θ. From elementary trigonometry, the length of sides A and B are given by A = C cos θ and B = C sin θ. Calculate the lengths of sides A and B given the hypotenuse C and angle θ.




2. The potential energy of an object due to its height above the surface of the Earth is given by the equation PE = mgh, where m is the mass of the object, g is the acceleration due to gravity, and h is the height above the surface of the Earth. The kinetic energy of a moving object is given by the equation KE = ½ $mv^2$, where m is the mass of the object and v is the velocity of the object. Write a C++ statement for the total energy (potential plus kinetic) possessed by an object in the Earth's gravitational field.

3. Write C++ statements required to calculate y(t) from the equation

$$y(t) = \begin{cases} -3t^2 + 5 & t \geq 0 \\ 3t^2 + 5 & t < 0 \end{cases}$$

for a user-supplied value of t.

4. Write a C++ program to convert all uppercase characters in a user-supplied character string to lowercase, without changing the lowercase and non-alphabetic characters in the string. Assume that your computer uses the ASCII collating sequence.

5. A mathematical operation between two vectors is the cross product. The cross product of two vectors V1 = $V_{x1}$ i + $V_{y1}$ j + $V_{z1}$ k and V2 = $V_{x2}$ i + $V_{y2}$ j + $V_{z2}$ k is a vector quantity defined by the equation:

   V1 × V2 = ($V_{y1}V_{z2} - V_{y2}V_{z1}$)i + ($V_{z1}V_{x2} - V_{z2}V_{x1}$)j +($V_{x1}V_{y2} - V_{x2}V_{y1}$)k

   Write a C++ program that will read two vectors V1 and V2 into arrays in computer memory, and then calculate their cross product according to the equation given above. Test your program by calculating the cross product of vectors V1 = 5i − 3j + 2k and V2 = 2i + 3j + 4k.

6. It is often useful to be able to simulate the throw of a fair die. Write a C++ function dice() that simulates the throw of a fair die by returning some random integer between 1 and 6 every time that it is called.

7. Minima and Maxima of a Function Write a subroutine that attempts to locate the maximum and minimum values of an arbitrary function f(x) over a certain range. The function being evaluated should be passed to the subroutine as a calling argument. The subroutine should have the following input arguments:

   first_value — The first value of x to search

   last_value — The last value of x to search

   num_steps — The number of steps to include in the search

   func — The name of the function to search

   The subroutine should have the following output arguments:

   xmin — The value of x at which the minimum was found

   min_value — The minimum value of f(x) found

   xmax — The value of x at which the maximum was found

   max_value — The maximum value f(x) found

8. Create a data type called “polar” to hold a complex number expressed in polar (z, θ). The derived data type will contain two components, a magnitude z and an angle θ, with the angle expressed in degrees. Write two functions that convert an ordinary complex number into a polar number, and that convert a polar number into an ordinary complex number.

9. From elementary geometry, we know that two points uniquely determine a line as long as they are not coincident. Write a function that accepts two values of type “point”, and returns a value of type “line” containing the slope and y-intercept of the line. If the two points are identical, the function should return zeros for both the slope and the intercept.

10. Two graphical shapes can be grouped together to form new shape. The so formed new shape can be combined with other shapes to form still a new shape. This can keep going on. Develop object model such that such relationship should be possible to imitate in memory.

11. Write a program that converts infix equation to postfix equation.

12. Write a function that accepts a real input array and returns a pointer to the largest value in the array.

13. Write a function that accepts a pointer to a real input array and returns a pointer to the largest value in the array.

14. Write a version of the insertion sort program that inserts the real input values into a doubly linked list. Test the program by creating 50 random values between −1000.0 and 1000.0, and sorting them with the program. Print out the sorted values in both ascending and descending order.

15. Create an abstract class called vec, which includes instance variables x and y, and abstract methods to add and subtract two vectors. Create two subclasses, vec2d and vec3d, that implement these methods for 2D and 3D vectors, respectively. Class vec3d must also define the additional instance variable z. Write a test program to demonstrate that the proper methods are called polymorphically when vec objects are passed to the addition and subtraction methods.

**Department:** Mechanical, Electrical, Electronics & Civil Engg. (UG)

**Course Title: -** Solar Ready Engineer

**Duration: -** Two Semesters (60hrs Theory & 60 hrs Practical)

**Venue:-** Solar Innovation Lab, Mech. Dept., NKOCET

| Day | Name of Topic | No. of Hours | Name of Practical | No. of Hours |
|---|---|---|---|---|
| 1 | Introduction to world energy scenario, Renewable energy resources | 2 | Solar radiation measurement-Lux meter | 2 |
| | Introduction to Solar energy, Solar Radiation, Types of solar radiation | 2 | | |
| 2 | Solar radiation measurements & Radiation measuring instruments | 3 | Demo on solar radiation Measurement-Pyranometer | 3 |
| | Solar thermal technology , Introduction to thermal systems , Importance of solar tracking systems | | | |
| 3 | Solar Water Heaters (SWH): - Basic working principle of solar hot water system – copper flat plate & Evacuated tube collectors (ETC) - Parts of a SWH & criticality. Installation guidelines | 3 | Trial on solar water heater | 3 |
| 4 | Solar cooker: -Basic working principle - Designs available in the market , Different types of Solar Cookers used in India | 3 | Demo on solar cooker | 3 |
| 5 | Operation & maintenance Design of solar cooker, Disadvantages & Limitations | 3 | Demo on solar tracking systems | 3 |
| 6 | Solar dryer- construction, working, Installation & maintains | 2 | Demo on solar dryer | 4 |
| | Design of solar dryer, | | | |
| 7 | Solar distillation- construction, working | 3 | Demo Solar PV Chamber | 3 |

| | | | | |
|---|---|---|---|---|
| | Solar PV Chamber | | | |
| 8 | Introduction to solar PV technician, Solar Photovoltaic ,Electricity basics,<br>Solar lighting system:<br>Description of main parts of solar lighting system: Comparative study of Conventional lighting system & solar lighting system | 03 | Demonstration of energy sources Tools,<br>Introduction & type of tools:- 1. Safety tools<br>2. Fire extinguisher<br>3. Marking tools<br>4. Working tools<br>5. Measuring tools<br>6. Testing tools | 03 |
| 9 | Fundamental of earthing system , Commercially available solar material technologies | 2 | Study of solar photovoltaic cell & solar photovoltaic module, type of photovoltaic cell & type and size of solar PV module | 2 |
| | PV module, Fundamental types of modules and its applications,<br>PV components and configuration etc. | 2 | | |
| 10 | Types of solar photovoltaic system<br>System components & inspection ,Site layout & marking , PV System Sizing series & parallel, Fundamental, temperature coefficients of current, voltage and power fundamental | 2 | Study of solar photovoltaic systems | 4 |
| 11 | Foundation & Structure reinforcement and basic related theory<br>a. Erection of structure , handling & installation of solar module<br>b. Cable trenching & cable laying<br>c. Introduction to bar bending trade glossary tools , components& equipment and its uses | 2 | Erection of structure& module mounting<br>Cutting/Bending/Tying of re-bar | 2 |
| | d. Identifying, marking, cutting of rods of required length & straightening bunch & coil | 2 | | |

| | | | | |
|---|---|---|---|---|
| | e. Tying of rods in position<br>f. Bending stirrups, cranks & chair bar<br>g. Layout, marking cage for column & footing base set into position | | | |
| 12 | Foundation & structure formwork and basic related theory<br>a. Introduction to formwork trade glossary, tools , components & equipment and its uses<br>b. Making of system straight shutter | 2 | Cutting of timber & plywood and drilling holes making of form box, staging and supporting arrangement Assembling & dismantling of Doka formwork | 2 |
| | c. Assembling & dismantling of foundation formwork<br>d. Assembling & dismantling of column formwork<br>e. Assembling & dismantling of beam & slab formwork system | 2 | | |
| 13 | Foundation & structure & masonry & Concreting and basic related theory<br>a. Introduction to masson trade glossary, tools , components & equipment and its uses & Preparation of cement mortar | 2 | Preparation of cement mortar Preparation of concrete mix Building stretcher bond corner | 2 |
| | b. Preparation of concrete mix<br>c. Building stretcher bond corner wall using english bond<br>d. Building cubical room using english bond | 2 | | |
| 14 | Most common types of commercially available PV products and systems, Construction of cable trenches & conduits<br>b. Cable tray support & tray erection | 2 | Cable tray support & tray erection requirement& use of tools & tackles | 4 |
| | c. Requirements & uses of tools & tackles | | | |

| | | | | |
|---|---|---|---|---|
| 15 | a. Operation & maintenance of solar power plant<br>b. Check list preparation<br>c. Soft & entrepreneurship skills<br>d. On job training at Project | 2 | Solar PV module cleaning & testing measurement of earth resistance, | 4 |
| | Check site conditions, collect tools and Raw materials for solar panel installation | | | |
| 16 | Cleaning of inverter, Cleaning of pole mounted CT/PT, Management of weeds and vegetation. | 2 | On job training at project premises. | 4 |
| | Installation of electrical substation Pole Erection, Types of pole Grid Fundamental, AC & DC Working ,AC side testing, DC side testing | | | |
| 17 | Cable tray , types of cable tray & Cable tray erection , Basic knowledge about Tools & Tackles required for PV plant installation | 2 | Use of tools and tackles and safe application practises<br>a. Voltmeter<br>b. Amp meter<br>c. Multi meter<br>d. Tong tester | 2 |
| | Battery, types of battery, Installation of battery, Design & Selection of Charge controller ,Battery | 2 | | |
| 18 | Basics & Design of AC & DC Motor | 2 | Demo on Solar AC & DC application | 4 |
| 19 | Solar sensible energy storing materials<br>Solar latent heat storing materials | 4 | Demo on solar system with energy storing materials | 2 |
| 20 | Introduction to solar PV simulation software | 2 | Demo on solar system simulation software | 4 |

**Prof. C. V. Papade**
**Course Coordinator**

**Dr. S. S. Metan**
**Programme Coordinator**
**HOD, Mech.**

**Dr. J. B. Dafedar**
**Principal**
**NKOCET**

TATA TECHNOLOGIES

Make it real. Make it better.

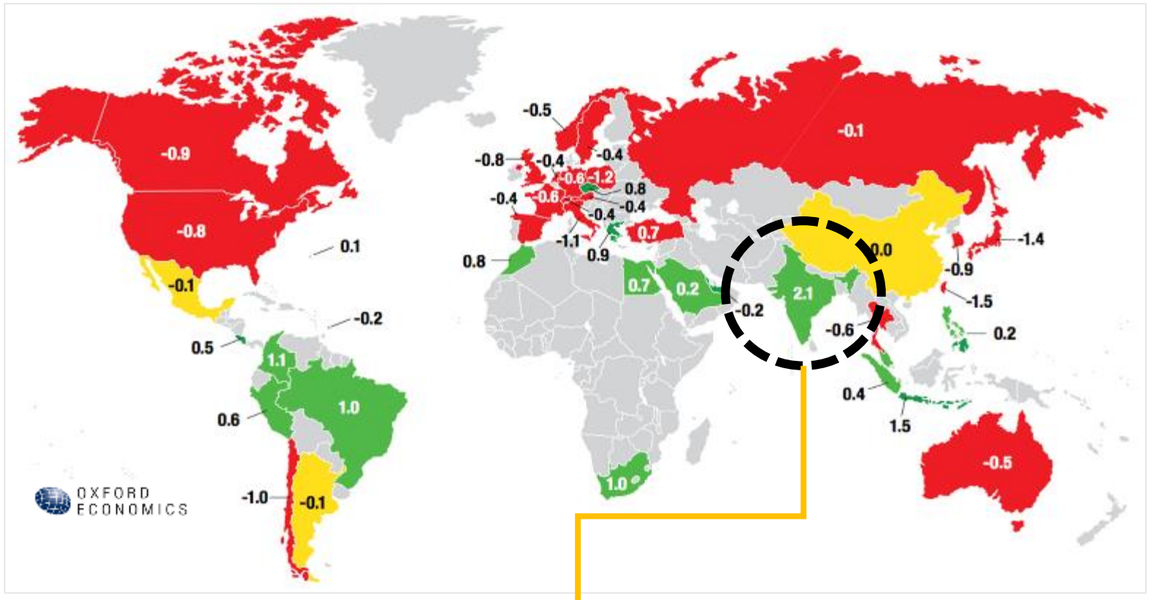
# Ready Engineer Program

Academic Year 2018-19

Corporate Social Responsibility Initiative by Tata Technologies Ltd.

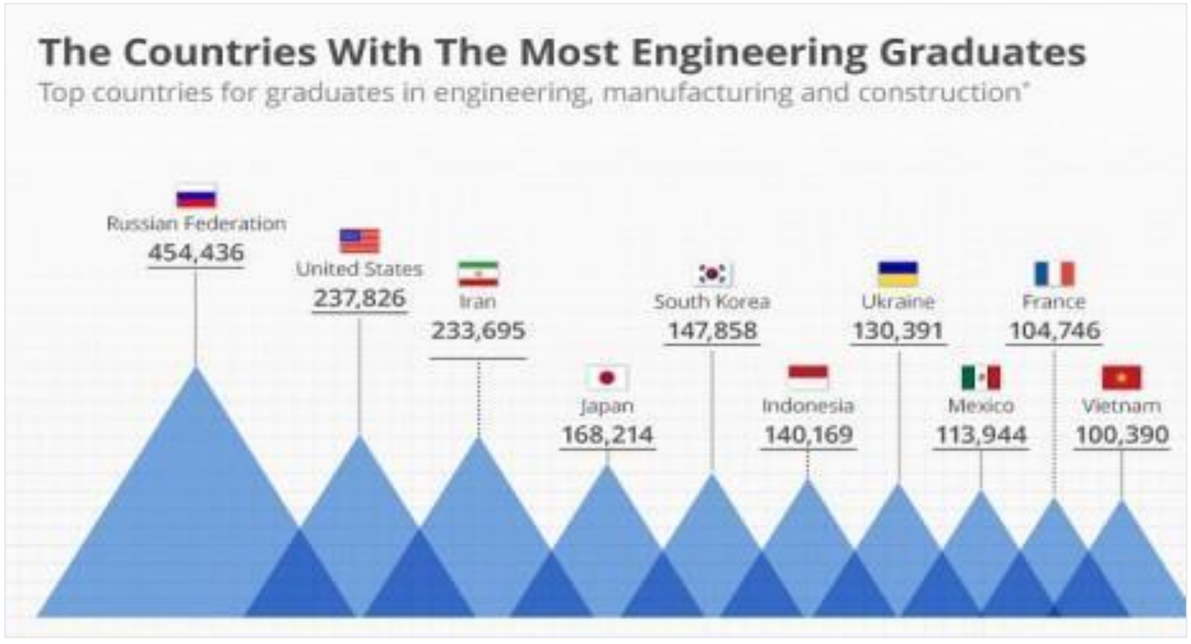
**Better Impact, Better People**

# Global Talent & Engineers Trend




## India on a surplus side with huge talent base

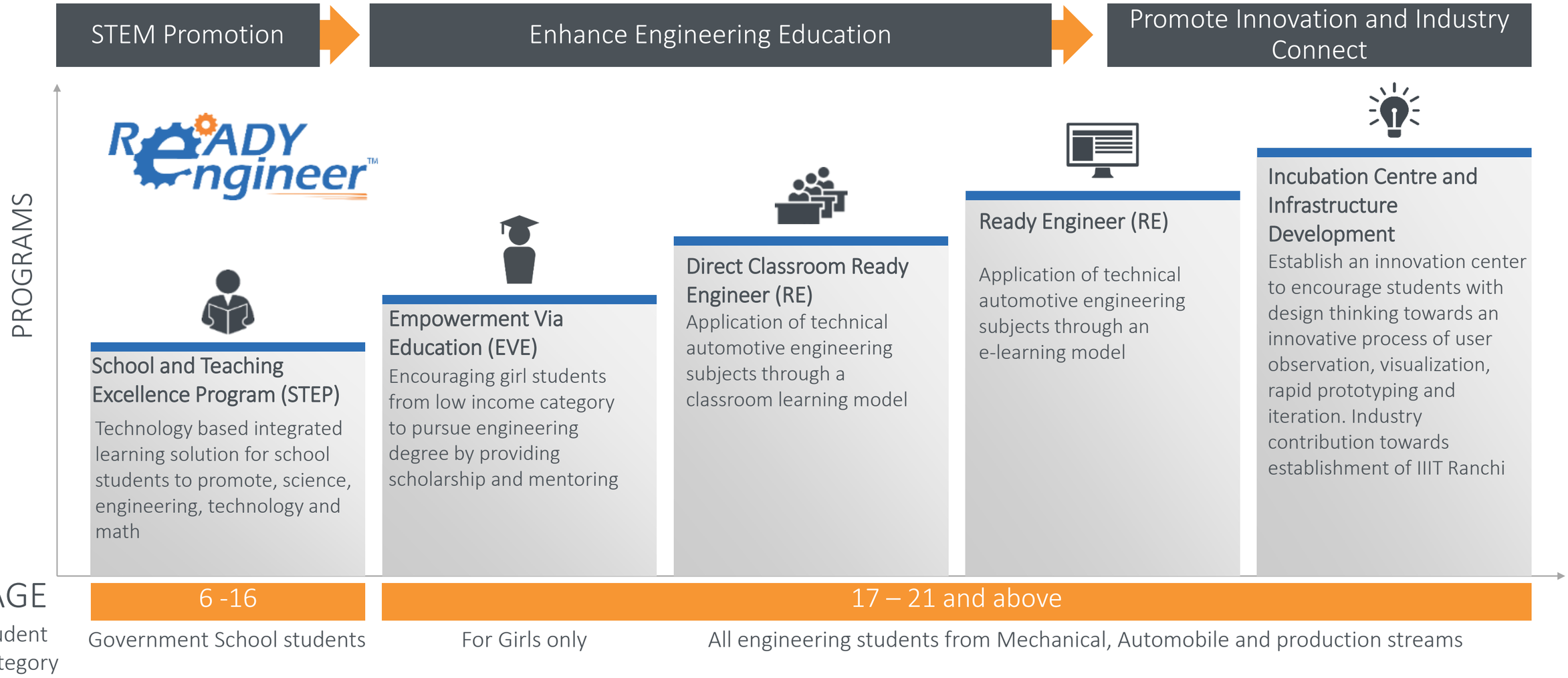
The gap between the ‘growth in demand’ and the ‘growth in supply’ of talent from 2011 to 2021. Red indicates a trend deficit, green a trend surplus, yellow a broad balance. India has a capacity to meet the global deficit of talent, provided we prepare our graduates for this challenge



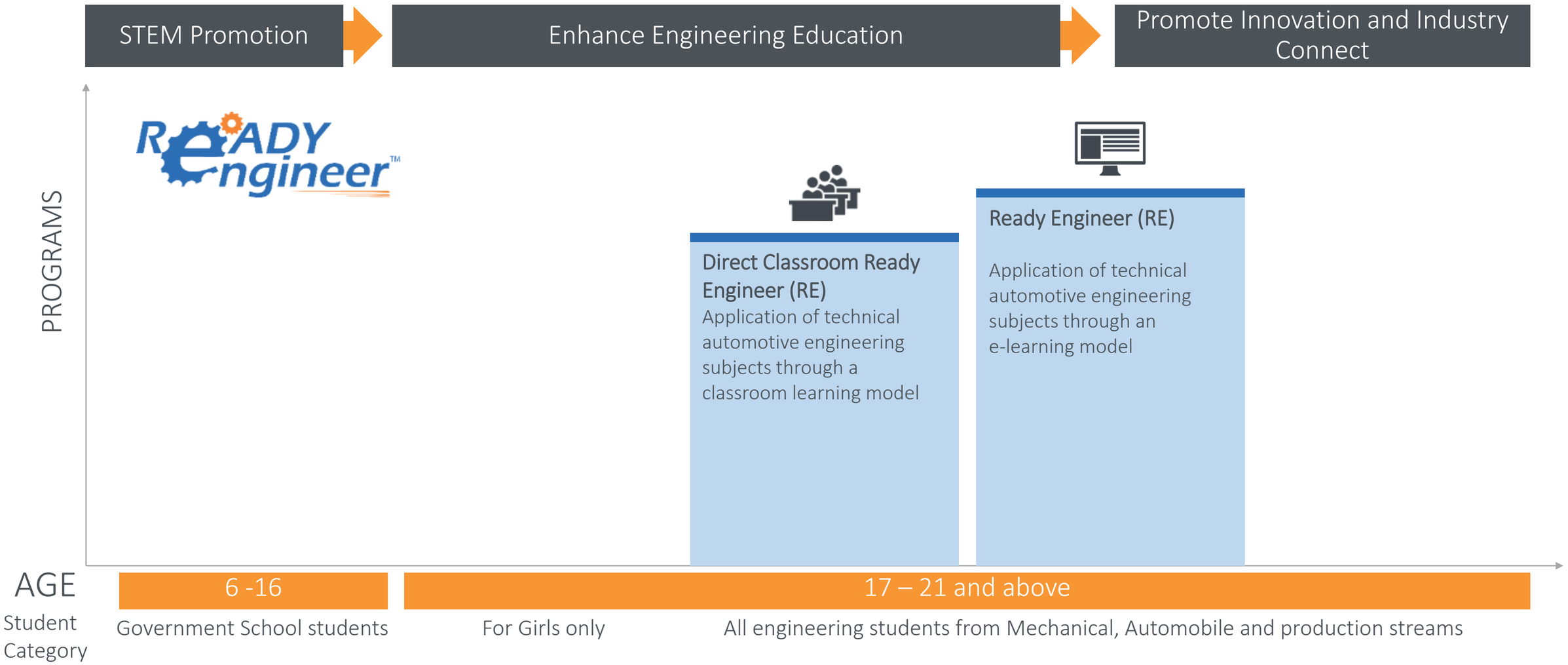

## India produces 15 Lakhs Engineers every Year

When it comes to engineering Graduates, India alone produces about 15 Lakh Engineers every year equivalent to top 7 countries put together (nearing to China with 13 Lakhs)

# Holistic Intervention across Education & Innovation Value-chain



# Holistic Intervention across Education & Innovation Value-chain



# Job Roles & Opportunities

## Job Roles

- Lead Design Engineer
- PLM Analyst
- CAE Analyst
- Manufacturing Engineer

GTEs | Apprentices

## Job Necessities

- Design Fundamentals
- Applied Design Engineering
- Hands-On experience
- Soft Skills

# Facts – Engineering Graduates in India

- Only 7 per cent engineering graduates are employable
- As many as 97% graduating engineers want jobs either in software or core engineering. But, only 3% have suitable skills to be employed in software or product market & only 7% can handle core engineering tasks.
- Despite the fact that the IT sector carries out the highest no. of recruitments from the pool of Engineers, only 18.43% Engineers are skilled enough to work there.
- The industry spends 1 Billion USD/year in training them for the job.
- Only 10 per cent of the engineers passing out of colleges from Tier 2/3 cities in the country are employable
- 40 per cent of the engineers do not have basic quantitative skills required for day-to-day life and entry-level engineering jobs

*Reference: NASSCOM; Aspiring Minds*

# Top Six factors affecting the employability of Engineers in India

1. Poor upgradation of Engineering syllabus w.r.t. technological developments and lack of application oriented content

2. Lack of experienced and qualified Professors in the colleges

3. Lack of innovation & research attitude among the engineering students

4. Lack of English communicative skills, analytical and quantitative skills

5. Limited hands-on training on the problems encountered in the industry

6. Lack of skill based education

*Reference: Aspiring Minds*

MANUFACTURED ENGINEERS

# Summarizing the necessities of an ‘Industry-ready’ Engineer

Engineering Fundamentals & Concepts

Engineering Applications & Contemporary Technologies

Soft Skills & Personality Traits

Employability Assessment

# Solution by Tata Technologies Ltd.

To be modified

READY Engineer™

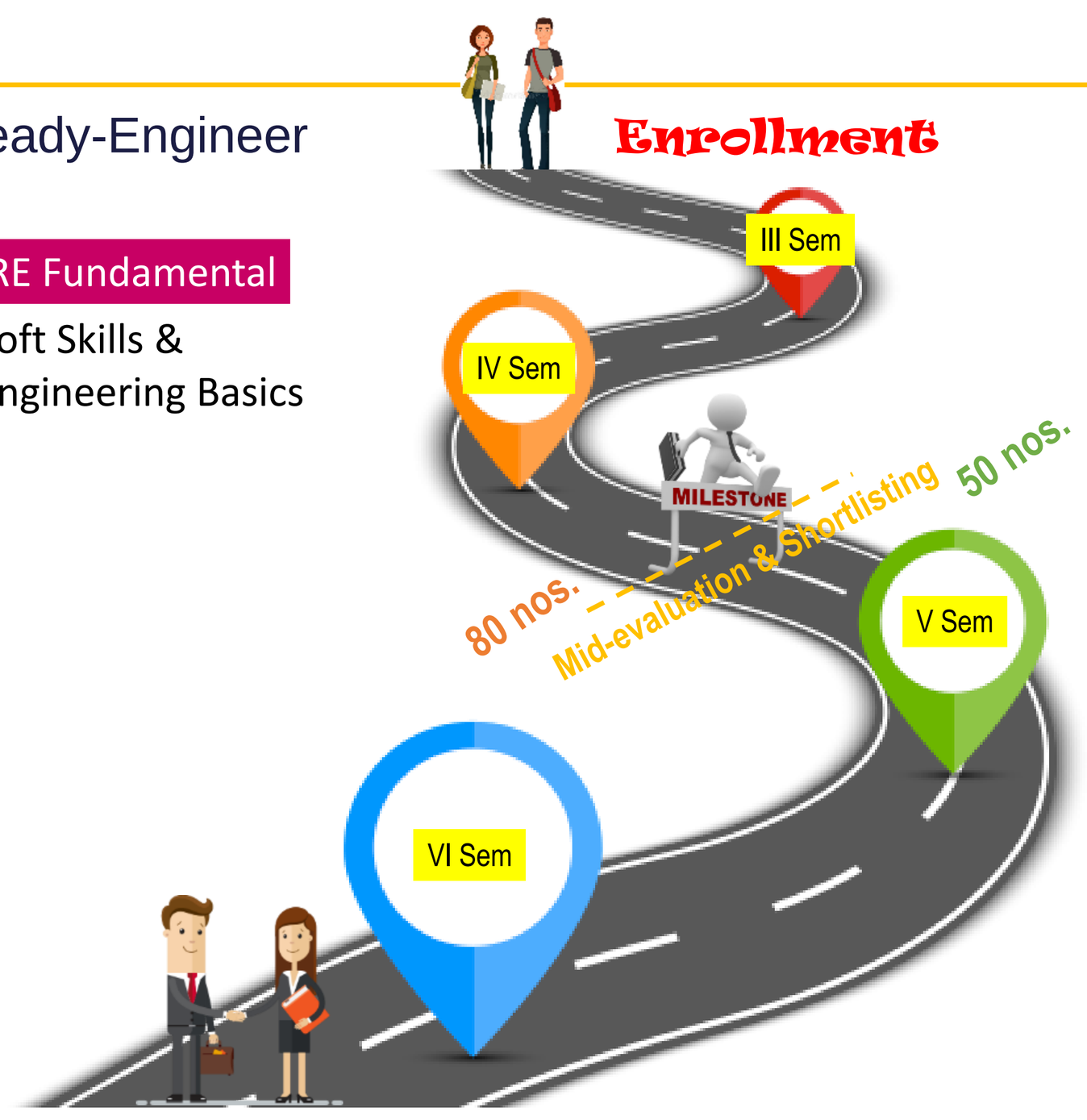
Ready Engineer Program is Tata Technologies' CSR initiative to make engineering graduates industry-ready


To make Engineers '**Industry-Ready'** by training them on engineering fundamentals & concepts, applications & contemporary technologies and soft skills to enhance their awareness, expand their industry connect & in process increase their employability.

# Learning Path of a Ready-Engineer

**RE Fundamental**

Soft Skills &
Engineering Basics




**RE Advanced**

Employability Skills &
**Core Technology Course**

**Certified Ready Engineer**

# Ready Engineer Program address the necessities

READY Engineer™

Engineering Fundamentals & Concepts

Engineering Applications & Contemporary Technologies

Soft Skills & Personality Traits

Employability Assessment

NPTEL | iGET IT TATA TECHNOLOGIES | Kengine Konnect | aspiringminds Employability Quantified

## Program Partners

Virtual Classroom | Discussion Forums | KRACKIN | SME access | Profile & Employment

# Program Flow Chart

**Phase 1**

Enrollment

**Phase 2**

Implementation

**Phase 3**

Assessment & Certification

**Phase 4**

Impact Measurement


READY Engineer™

# Program Flow Chart

**Phase 1 Enrollment**


- Enrollment starts in 2nd year Mechanical Engineering i.e. III Semester
- No. of seats limited for enrollment are 80 nos. per college
- Tata Technologies shall provide broad guidelines for shortlisting of students
  - ✓ Girl Students
  - ✓ Economically deprived
  - ✓ Merit & Interest
- College shall shortlist the students for the enrollment
- Shortlisted Students shall register on the Ready Engineer exclusive portal within the set deadline
- College SPOC shall review, verify & approve the students information on the Ready Engineer portal
- A Unique Registration ID No. shall be allocated

# Program Flow Chart

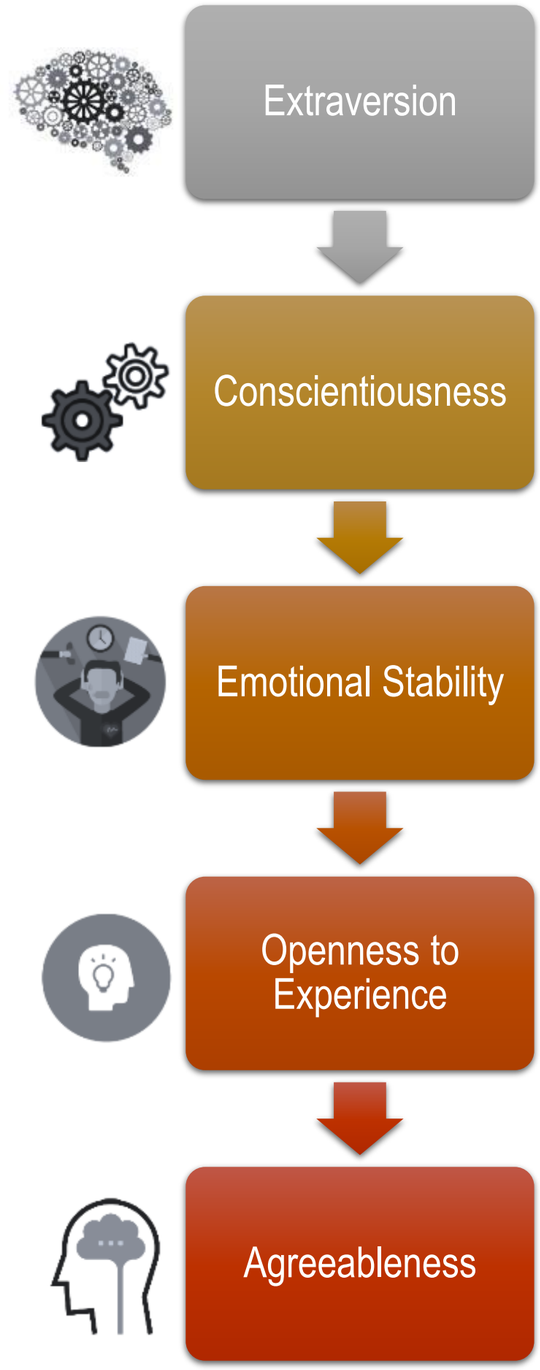
**Phase 2 Implementation**

2nd & 3rd Year

aspiringminds
Employability Quantified

## Employability Assessment – Part 1
For Ready Engineer SE/Sem III Batch

- **AMPI (Personality Inventory) test** shall be conducted post enrollment stage for all the 80 shortlisted students
- Understanding how a candidate will behave in various situations can determine his or her success in performing specific roles, AMPI provides the insights of a candidate's personality so that you can have a better understanding of their productivity, performance & trainability
- AMPI is an **contemporary five-factor model** of personality also commonly known as the "Big Five" model. It measures five broad traits
- Detailed score card & individual report shall be provided to each student
- Students are further advised to improve upon their week areas with the help of the various reference trainings links provided



# Program Flow Chart

**Phase 2 Implementation**

2nd & 3rd Year

aspiringminds
Employability Quantified

## Employability Assessment – Part 2
For Ready Engineer TE/Sem V Batch

- **AMCAT (Common Aptitude Test)** shall be conducted for all the shortlisted 50 students in TE in Sem V
- AMCAT is a multi-dimensional adaptive instrument that measures the knowledge, skills and personality required for multiple job roles.
- AMCAT Covers four broad employability skills
- Detailed score card & individual report shall be provided to each student
- Students are further advised to improve upon their week areas with the help of the various reference trainings links provided

# Program Flow Chart

**Phase 2**
**Implementation**

2nd & 3rd Year

NPTEL

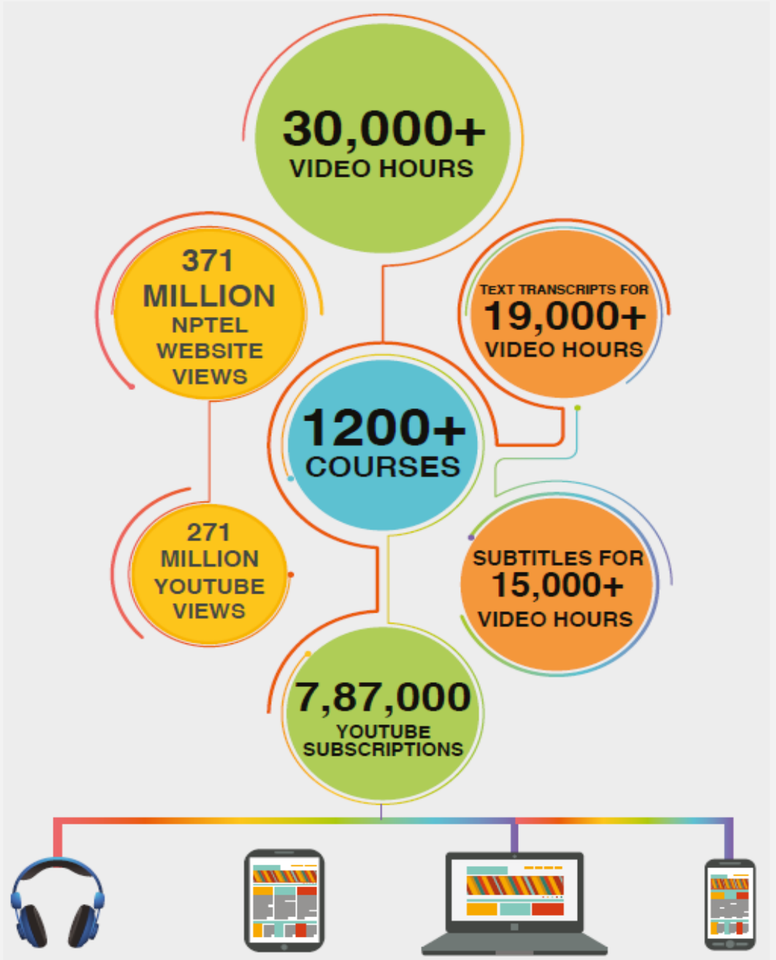
## Engineering Fundamentals & Concepts

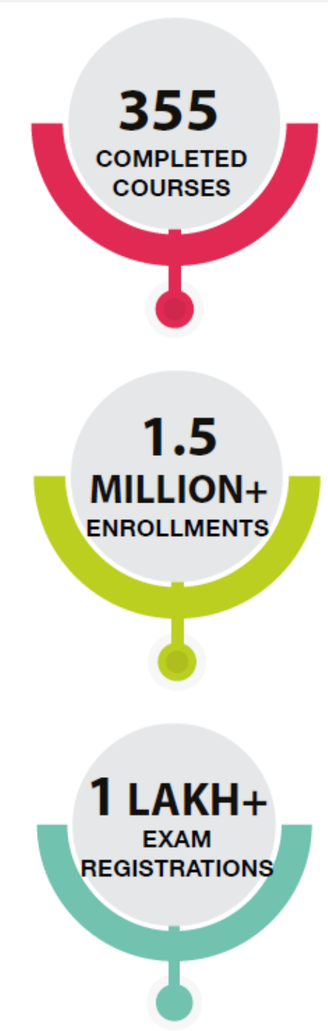
### For SE & TE Students – All Sem

The National Programme on Technology Enhanced Learning (NPTEL), a project funded by the Ministry of Human Resource Development provides e-learning through online Web and Video courses in Engineering, Sciences, Technology, Management and Humanities. This is a joint initiative by seven IITs and IISc Bangalore

IIT KHARAGPUR IIT MADRAS IIT ROORKEE IISc BANGALORE

IIT BOMBAY IIT DELHI IIT GUWAHATI IIT KANPUR



# Program Flow Chart

**Phase 2**
**Implementation**

2nd & 3rd Year

NPTEL

## Engineering Fundamentals & Concepts

For SE & TE Students – All Sem

- TTL shall provide 50% scholarship of the assessment fees for the students attending & passing the NPTEL assessment
- For SE Students, there shall be 40 Scholarships per RE Batch per year
- For TE Students, there shall be 70 Scholarships per RE Batch per year
- TTL, College authority and NPTEL shall mutually decide the scholarship issuing guidelines
- TTL has identified and published list of limited NPTEL courses for which the scholarship shall be available. These are typically 50+ high-end courses across Mech, Aeronautical, Design, Robotics Engg.
- NPTEL Exam are conducted across 200 cities in India. Typically Jun-Nov & Jan-Apr batches
- College SPOC shall initiate the process to create NPTEL Local Chapter and coordinate with NPTEL SPOC for detailed information and Scholarship shortlisting process

## Who Uses NPTEL?

### 70% Students

Strengthen fundamentals
Access to high quality faculty
Learn at one's own pace
Tangible end results
Improve employability

### 15% Faculty

Strengthen foundation
Explore new domains
Faculty development program
Keep up continuous learning

### 15% Industry

Skilled recruits
Job ready hires
Fresher training
Employee reskilling

# Program Flow Chart

**Phase 2 Implementation**

2nd & 3rd Year

Kengine Konnect

## Soft Skills
For SE & TE Students – All Sem

- Soft Skill trainings shall be provided through online LMS platform
- Over 96 topics are covered through 6 programs
- Training modules shall be assigned to the students across 4 semesters
- College SPOCs shall keep track & encourage students to complete the courses
- Each topic shall be provided with an assessment to test the knowledge gained by the student

Over 96 Topics across 4 Semesters

- P1: Proficiency in Communication
- P2: Mastery in Communication
- P3: Professional Development
- P4: Personal Development
- P5: Project Management Tools
- P6: Career Building

# Program Flow Chart

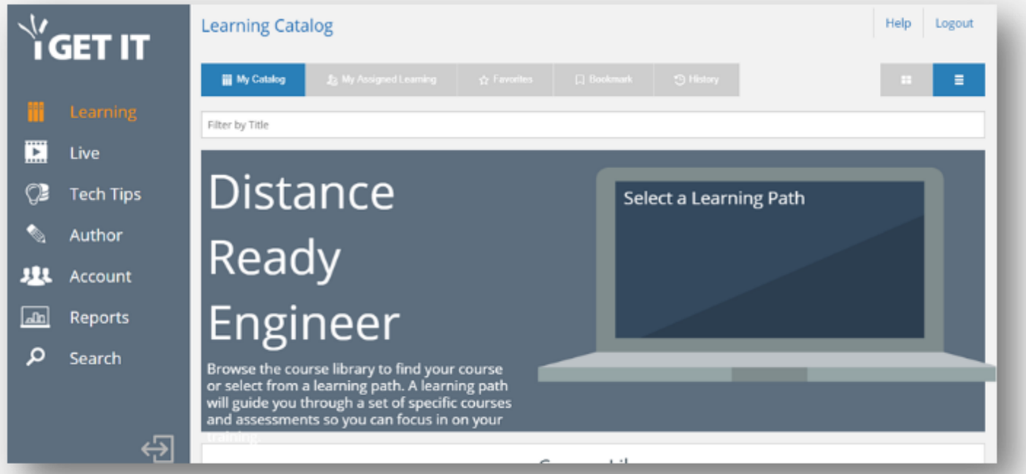
**Phase 2**
**Implementation**

3rd Year

iGET IT® TATA TECHNOLOGIES

## Automotive Design
### For TE Students / Sem V & VI

- TTL's exclusive Knowledge Platform
- Over 200 courses in design domain
- College SPOCs shall keep track & encourage students to complete the courses
- Each topic shall be provided with an assessment to test the knowledge gained by the student




| | |
|---|---|
| creo A PTC Product | PTC Creo |
| ProENGINEER WILDFIRE | PTC ProENGINEER |
| SOLID EDGE | Solid Edge |
| SOLIDWORKS | SOLIDWORKS |

| | |
|---|---|
| SKETCHBOOK | Autodesk SketchBook |
| | Automotive |
| CATIA V5 | CATIA V5 |
| CATIA V6 | CATIA V6 |
| | Finite Element Analysis |

| | |
|---|---|
| FUSION 360 | Autodesk Fusion 360 |
| INVENTOR | Autodesk Inventor |
| NAVISWORKS | Autodesk Navisworks |
| REVIT | Autodesk Revit |
| SHOWCASE | Autodesk Showcase |
| SIMULATION | Autodesk Simulation |

| | |
|---|---|
| AUTOCAD | AutoCAD |
| AUTOCAD ELECTRICAL | AutoCAD Electrical |
| AUTOCAD MECHANICAL | AutoCAD Mechanical |
| AUTOCAD P&ID | AutoCAD P&ID |
| 3DS MAX | Autodesk 3ds Max |
| ALIAS | Autodesk Alias |

# Program Flow Chart

**Phase 2**
**Implementation**

3rd Year

iGET IT® TATA TECHNOLOGIES

## Automotive Design Part 1
For TE Students / Sem V

40 hrs.

**Module 1: Styling**
Design basics, Product life cycle, Design studio, CAS surfaces

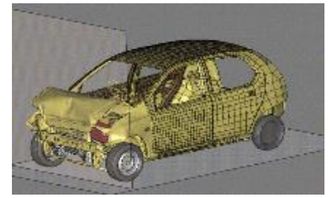
**Module 2: Design & Development**
Body-in-White, Bonnet design case study, Functions, CAE, Durability, Crash

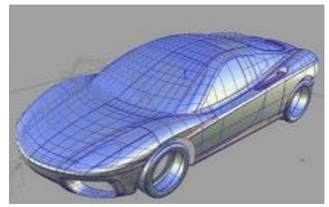
**Module 3: Computer Aided Engineering**
Product Lifecycle Management, Finite Element Analysis, Crashworthiness, discretization, NVH, EuroNCAP, HPC

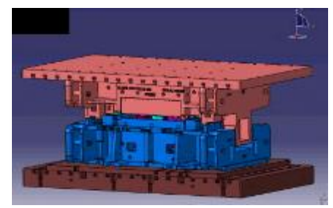
**Module 4: Formability**
Sheet metal design, simultaneous Engg., draw dies, draw model, Forming Limit Curve

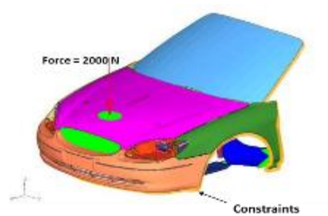
**Module 5: Die Design**
Die design process, Presses, types of dies, working of dies, real life examples

**Module 6: Fixture Design**
Fixture design process, welding, body coordinates, 3-2-1 principles, GD & T, Fixture elements, operations in sheet metal









# Program Flow Chart

**Phase 2**
**Implementation**

3rd Year

iGET IT® TATA TECHNOLOGIES

## Automotive Design Part 2
For TE Students / Sem VI


40 hrs.

### Body in White

1. Requirement Specification in the Pre-Program Stage
2. Product life cycle and important gateways for BIW
3. Identification of commodities for BIW
4. Design concepts and considerations in BIW
5. BIW Materials and Grades
6. GD & T for BIW
7. Sheet metal Joining - Welds, Adhesives, TWBs
8. DFMEA
9. Design Verification - CAE methods and Gateway supports Part A & B
10. CAE Analysis - NVH, Crash & Durability
11. Test Validation & Assessment
12. Manufacturing - Sequence, Welding & Assembly
13. Future Trends in BIW
14. BIW: Examples and Case Studies

### Trims & Plastics

1. Requirement Specification in the Pre-Program Stage
2. Product life cycle and important gateways for Trims
3. Identification of commodities for Trims
4. Design requirements and considerations
5. Trim Materials in Automotive
6. Design of Plastic part
7. DFMEA
8. Design verification - CAE methods and Gateway supports
9. CAE Analysis – Moldflow. Crash & Durability
10. Manufacturing Process
11. Test Validation & Assessment
12. Assembly Sequence
13. Future Trends and Future materials for Trims
14. Trims: Examples and Case Studies

# Program Flow Chart

**Phase 2**
**Implementation**

2nd & 3rd Year

KRACKIN

## Virtual Classroom
For SE & TE Students / All Sem

Virtual Classroom | Discussion Forums | SME access | Profile & Employment

### Learning resources
- Videos, eLearning
- Articles, Challenges

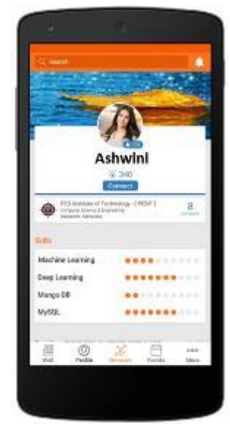
### Internships
- Apply for intership in start-ups
- Get selected based on Profile score

### Projects
- Online Projects
- Problems from industry

### Jobs
- Apply to companies across country
- Companies select based on Profile employability score

### Mentoring
- SMEs and experts from industry to answer queries

### Industry Events
- Hackathons and Challenges from the industry


GET IT ON Google Play

# Learning Path of a Ready-Engineer

**Enrollment**

- ✓ AMPI Personality Inventory Test & Report
- ✓ Soft Skills Modules P1
- ✓ NPTEL Scholarship – Batch 1
- ✓ KrackIN Profile

III Sem

- ✓ Soft Skills Module P2
- ✓ NPTEL Scholarship – Batch 2
- ✓ KrackIN Profile Update
- ✓ Volunteering & CSR activity

IV Sem

MILESTONE

80 nos. Mid-evaluation & Shortlisting 50 nos.

V Sem

- ✓ AMCAT Test & Report
- ✓ Soft Skills Modules P3 & P4
- ✓ NPTEL Scholarship – Batch 3
- ✓ KrackIN Profile Update

- ✓ Automotive Design – Part 1
  PLM, CAE, Catia

- ✓ Soft Skills Modules P5 & P6
- ✓ NPTEL Scholarship – Batch 4
- ✓ KrackIN Profile Update
- ✓ Ready Engineer Test & Certification

- ✓ Automotive Design – Part 2
  Body-in-While & Plastics

VI Sem

**Certified Ready Engineer**

# Program Flow Chart

**Phase 3**
**Assessment & Certification**

- Final examination shall be conducted at the end of VI Semester which will cover Domain course, & Soft Skills

- Ready Engineer Certificate shall describe:
  - Score in the Domain test
  - Attendance during the Classroom sessions of Domain course
  - Score in Soft Skills
  - No. of NPTEL Courses Passed
  - AMCAT & AMPI Scores

- College SPOC shall coordinate & assist, TTL & Program Partners for conducting the assessments

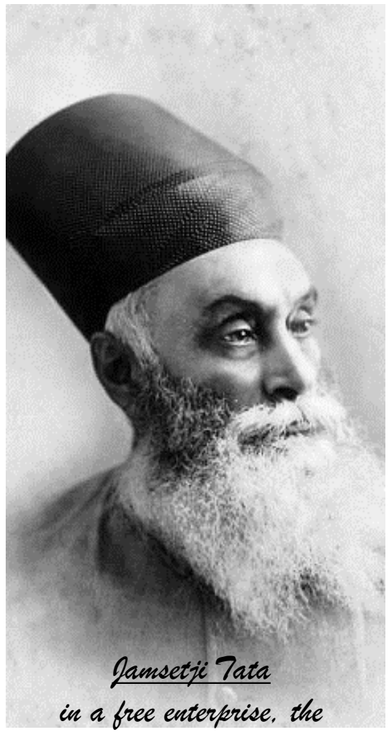

# Program Flow Chart

**Phase 4**
**Impact Measurement**

- Tracking no. of Ready Engineers employed across the industry
- Documenting the achievements of Ready Engineer Students e.g. Awards, Paper Presentations, Participation in National & International Events
- Tracking no. of Ready Engineers turning entrepreneurs
- Building a Ready Engineer Community

# Program Flow Chart

**Volunteering**



*Jamsetji Tata*
*in a free enterprise, the community is not just another stakeholder in business but is in fact the very purpose of its existence*

## Ready Engineer's Social Responsibility Campaign

- Tata Technologies encourage the Ready Engineers students to take up the Volunteering activity during their course
- TTL recommends one semester one activity model
- The fees collected for Ready Engineer course shall be utilized for the volunteering activity

# Ready Engineer Map

39 Colleges | 6 Cluster | 2 States

NEW Aurangabad Cluster - 8 Colleges

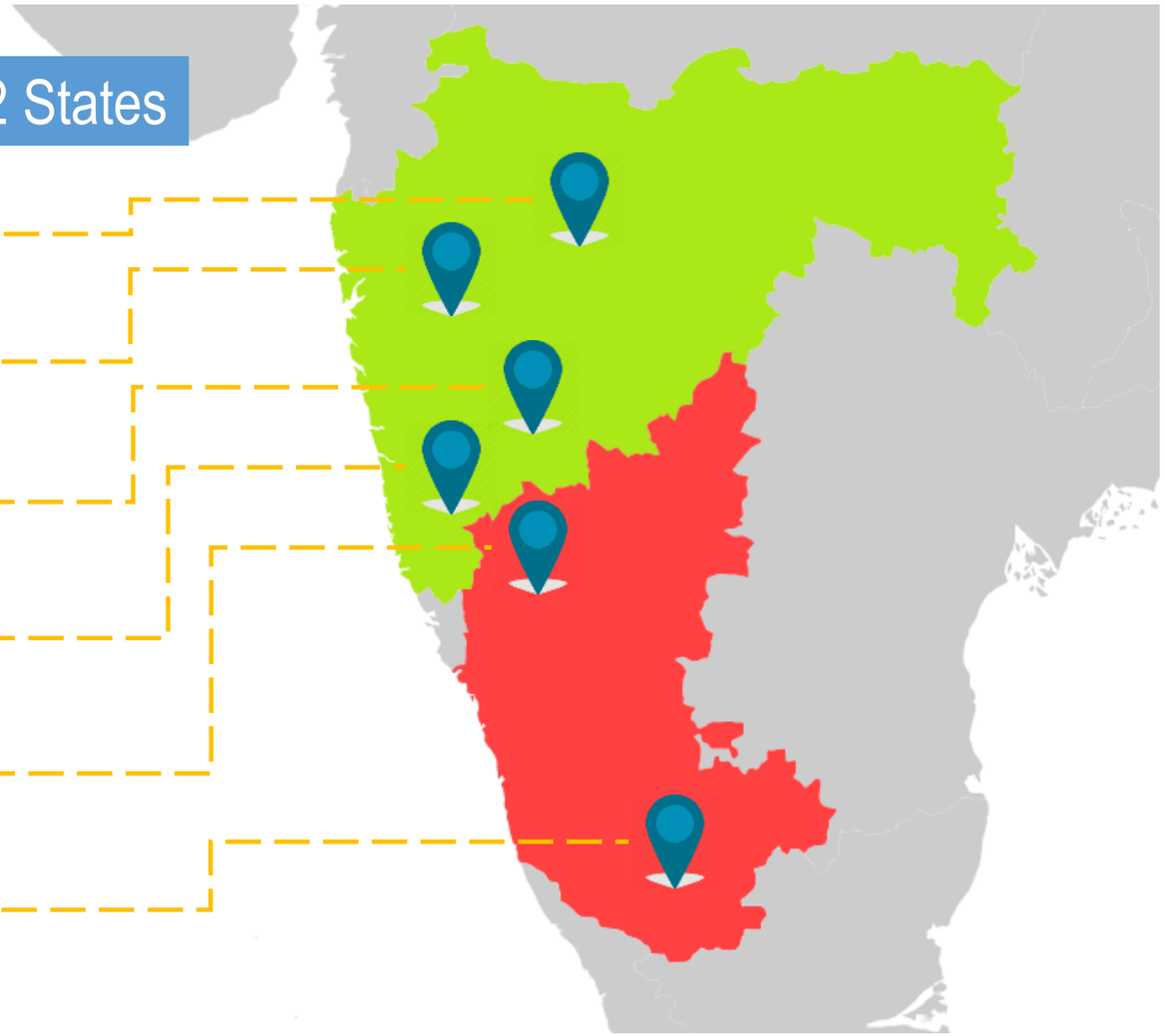
Pune Cluster - 1 College

Solapur Cluster - 12 Colleges

Kolhapur Cluster - 6 Colleges

Dharwad Cluster - 6 Colleges

Bangalore Cluster - 6 Colleges

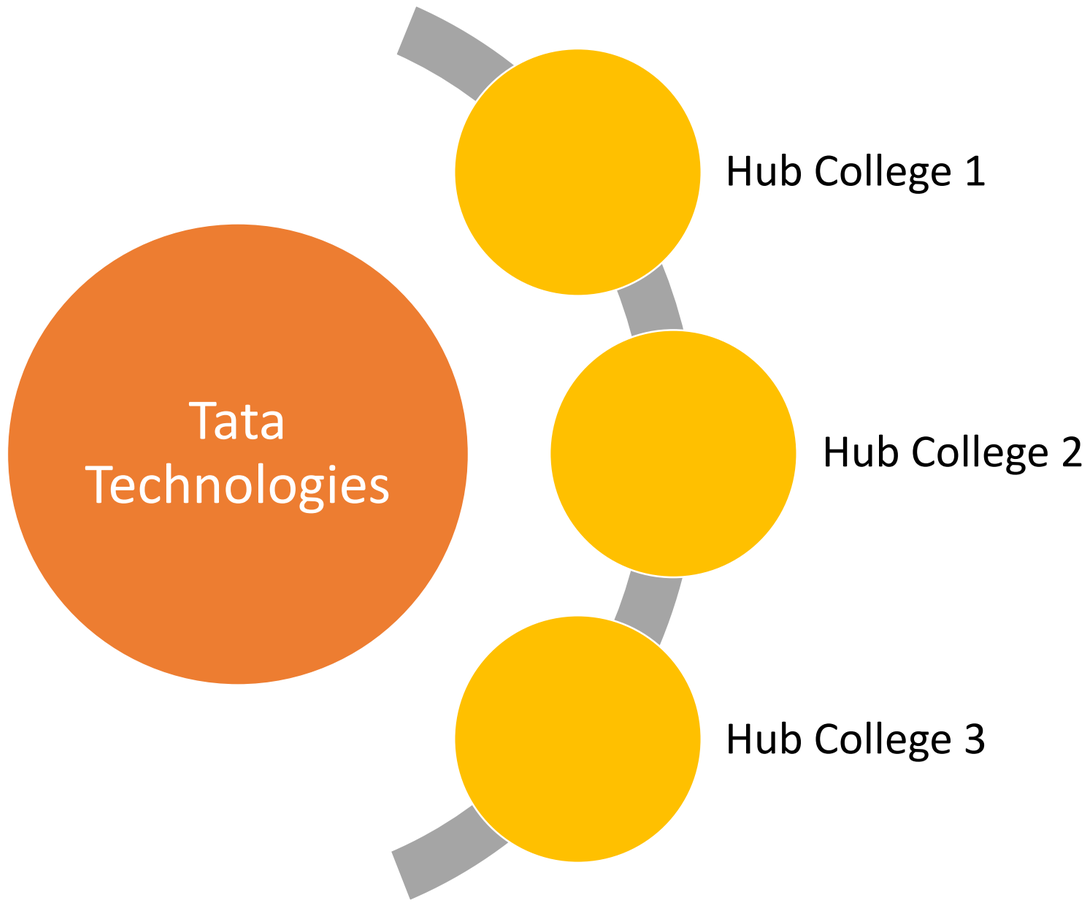


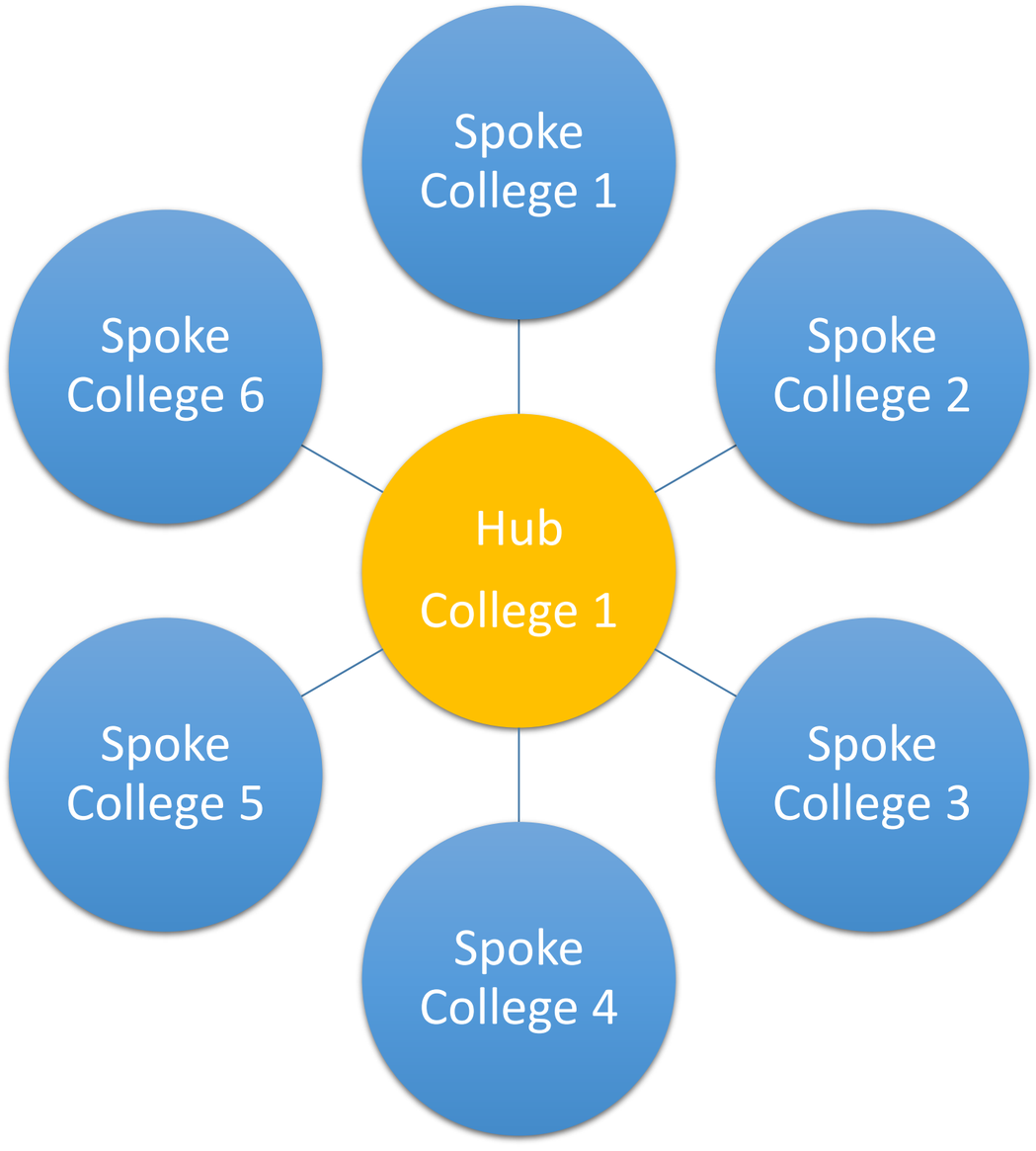
3000 Students

120 Professors

40 SMEs

# Execution: Hub & Spoke Model



# Responsibility Matrix at RE College

| | | |
|---|---|---|
| RE, SPOC | HoD of Mech. Engg. Dept. | ✓ All the communication shall be routed through the SPOC<br>✓ Responsible & accountable for effective execution of the RE program (Enrollment-Implementation-Assessment-Impact)<br>✓ Shall conduct monthly review meetings with all RE Professors & select students<br>✓ Shall nominate an 'RE – Lead Professor' for day-to-day coordination with TTL & Program partners<br>✓ Shall review & approve the list of shortlisted students for the RE Program in SE & TE<br>✓ Shall review & approve the collection & spending of the RE fees<br>✓ Shall provide an annual impact report broadly stating benefits of RE Program e.g. achievements of RE students such as placements, awards, projects, participation in national and international events etc. |
| RE, Lead Professor | Professor from Mech. Engg. Dept. | ✓ Shall be nominated by HoD Mech. Engg. for day-to-day coordination with TTL/Program partners<br>✓ Prepare the list of shortlisted students for the RE Program in both SE & TE<br>✓ Shall be responsible for collection & spending of the RE fees as per TTL guidelines<br>✓ Shall be responsible for conducting the assigned no. of classroom sessions & cover the course syllabus in prescribed time<br>✓ Arrangement of computer labs to conduct the assessment tests as per the program<br>✓ Lead all sorts of ground works for effective execution of the RE program |
| RE, Professor | Professor from Mech. Engg. Dept. | ✓ Shall be nominated by HoD Mech. Engg. for assistance to RE – Lead Professor<br>✓ Multiple RE Professors can be nominated as necessary by the HoD Mech. Engg. |
| Principal | | ✓ Shall be updated with all the developments of the RE program<br>✓ Shall oversee the overall conduct of the program & provide necessary guidance & inputs to all stakeholders |

# Role of Hub & Spoke College

- **MOU**
  - HC shall host the MOU signing meeting and make necessary arrangement.
  - HC shall coordinate with satellite colleges for MOU signing meeting
- **Professor Training (Train the Trainer)**
  - HC will host training program and make necessary arrangement.
  - HC will nominate SPOC (Single Point of Contact) professor responsible for the entire coordination of Ready Engineer course with satellite colleges.
  - HC SPOC will be the link between Tata Technologies & satellite colleges for all communication related to Ready Engineer course.
  - HC will nominate 3 to 4 professors for the training program and ensure all attain it.
  - HC will maintain all the data related to training.
- **Enrollment**
  - Interested students from second & third year Mechanical Engineering branch only are eligible to enroll for this program.
  - For Second Year Students, the course shall contain Personality Assessment Test, Soft Skill Training Level - 1 and NPTEL scholarship for course assessment.
  - For Third Year Students, the course shall contain Employability Assessment Test, Soft Skill Training Level - 2, Technical Domain training and NPTEL scholarship for course assessment.
  - Tata Technologies after mutual discussing will all colleges will set a deadline for the enrollment, HC will ensure about receiving the enrollment data from all satellite colleges as per the deadline.
  - HC will maintain master sheet of the enrolled students which will consist students name, email id, mobile numbers and college id number from satellite colleges.
  - This master sheet will be shared with Tata Technologies for getting iGETIT license.
  - Tata Technologies will generate the licenses of IGETIT and share the same to respective college after receiving the enrollment data.
  - For any query regarding iGETIT license, college will coordinate with Tata Technologies.

# Role of Hub & Spoke College

- **Course Conduct**
  - Hub College would be the primary facilitator of Ready Engineer Program and would ensure the smooth functioning of the program in all the satellite colleges.
  - In case any college fails to conduct a batch in a particular year, they will have to justify the reason for not conducting the course, which will be reviewed by TTL and the decision for course continuation will be taken accordingly.
  - Training module be equally divided with the trained professor in order to avoid any load on a particular professor.
  - In case any of the trained DRE professor or SPOC resigns / transfers, same should be updated to Tata Technologies and handover the details to concerned person.
  - All college will prepare a training calendar for Ready Engineer program. HC will share this training calendar with Tata Technologies before commencement of program.
  - HC will share the course progress of all satellite college with Tata Technologies on monthly basis.
  - Every college will conduct one volunteering activity per batch under Ready Engineer volunteering campaign. HC will share this data with Tata Technologies.
- **Examination**
  - Hub College will assist in finalizing the exam centers
  - HC after mutual discussion with satellite college will decide the exam date and convey the same to Tata Technologies.
  - HC will ensure the smooth operation of examinations as per the schedule.
  - HC will ensure maximum attendance of registered students from satellite colleges for Ready Engineer exam.
  - HC will collect the prerequisite data like number of computers, OS etc. from satellite colleges required for conducing the exam and share with Tata Technologies.
  - In case of any variation in registered students and those appearing for final Ready Engineer exam, HC shall escalate to Tata Technologies.
- **Certification**
  - Students qualifying the final DRE exam will be awarded the Certified Ready Engineer certificate.
  - Tata Technologies will distribute the certificates to each college separatory.
  - HC will confirm about all satellite college receiving the certificates.

# Thanks You

## Open Discussion

# Making product development dreams a reality since 1989.

For further information about Tata Technologies and what we can do to help you create better products for your customers, simply check out our website www.tatatechnologies.com