

**Vidya Pratishthan's
Kamalnayan Bajaj Institute of
Engineering and Technology**



**Faculty of Science and
Technology**

**Board of Studies
Computer Engineering**

Syllabus

**Exit Course
Computer Engineering
(w.e.f. AY: 2023-24)**

Syllabus: First Year (FY B. Tech.) Computer Engineering
w.e.f. AY:2023-2024

Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks							Credits			
		TH	PR	TUT	ACT	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
ECO23101	Skill Based Courses (Online/Offline)		4		10			20		30			2		
ECO23102	Work Based Voc. Courses (Online/Offline)		4		10			20		30			2		
ECO23103	Internship		25		50			50		30			4		
Total					70			90		90			8		

Skill Based Courses (Online/Offline)		Work Based Voc. Courses (Online/Offline)	
ECO23101A	Data Visualization using Python	ECO23102	IT Workshop
ECO23101B	Programming, Data Structure & Algorithms using Python (Online)		

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Data Visualization Using Python (ECO23101A)		
Teaching Scheme: TH: 00 Hrs./Week PR: 04 Hrs./Week	Credits 02	Examination Scheme: Course activity: 10 Marks Term work : 20 Marks Oral exam : 30 Marks
Prerequisite Courses, if any: Students are expected to have a good understanding of basics of the Python programming language.		
Companion Course, if any: No		
Course Objectives: <ol style="list-style-type: none"> 1. To introduce students to the fundamental problems, concepts, and approaches in the design and analysis of data visualization systems. 2. To understand the practice of data visualization. 3. To leverage use of tools for the data visualization. 4. To learn the applications of data visualization for the IT industry. 		
Course Outcomes: On completion of the course, learner will be able to – <ol style="list-style-type: none"> 1. Demonstrate the critical theories of design, systems thinking, and design methodologies for data visualization. 2. Produce great designs, be a more effective engineer, and communicate with high emotional and intellectual impact. 3. Understand the diverse methods employed in design thinking and establish a workable design thinking framework to use in their practices 4. Conceive, organize, lead and implement projects in interdisciplinary domain and address social concerns with innovative approaches 		
Course Contents		
<p style="text-align: center;">Data visualization basics</p> <p>Basics of data visualization: Python libraries for creating data visualization: Matplotlib: Basic plot, scatter plot, Bar Chart Seaborn Pandas Customization Create a line plot using Matplotlib to visualize the trend of temperature over a week</p>		
<p style="text-align: center;">Exploring the titanic dataset with Seaborn Library</p> <p>Use the inbuilt dataset 'titanic'. The dataset contains 891 rows and contains information about the passengers who boarded the unfortunate Titanic ship. Use the Seaborn library to see if we can find any patterns in the data.</p> <p>Write a code to check how the price of the ticket (column name: 'fare') for each Passenger is distributed by plotting a histogram.</p>		

Box plot for the distribution

1. Use the inbuilt dataset 'titanic' as used in the above problem. Plot a box plot for distribution of age with respect to each gender along with the information about whether they survived or not. (Column names : 'sex' and 'age')
2. Write observations on the inference from the above statistics.

Understand the Concept of Outliers

Download the Iris flower dataset or any other dataset into a DataFrame. (e.g., <https://archive.ics.uci.edu/ml/datasets/Iris>). Scan the dataset and give the inference as:

1. List down the features and their types (e.g., numeric, nominal) available in the dataset.
2. Create a histogram for each feature in the dataset to illustrate the feature distributions.
3. Create a box plot for each feature in the dataset.

Compare distributions and identify outliers.

Text Books:

1. Ward, M., Grinstein, G. G., & Keim, D. (2015). Interactive Data Visualization : Foundations, Techniques, and Applications, Second Edition (Vol. Second edition).
2. Wes McKinney, "Python for Data Analysis", O' Reilly media, ISBN : 978-1-449-31979-3.

Reference Books:

1. Bertamini, M., & Kubovy, M. (2018). Human Perception. Routledge.
2. Mohammad Alharbi, & Robert S. Laramée. (2019). SoS TextVis: An Extended Survey of Surveys on Text Visualization.
3. Cao, N., & Cui, W. (2016). Introduction to Text Visualization. Atlantis Press.
4. Dimara, E., & Perin, C. (2020). What is Interaction for Data Visualization?
<https://doi.org/10.1109/TVCG.2019.2934283>
5. Federico, P., & Miksch, S. (2016). Evaluation of two interaction techniques for visualization of dynamic graphs.
6. Geospatial data and knowledge on the Web : Knowledge-based geospatial data integration and visualisation with Semantic Web technologies. (2020). [Lund University, Faculty of Science, Department of Physical Geography and Ecosystem Science].

Link for Reference:

- <https://www.sciencedirect.com/science/article/pii/S1877042811029648>
- <https://doi.org/10.1109/TVCG.2019.2934283>
- <https://doi.org/10.1093/bioinformatics/btw669>
- <https://www.edureka.co/blog/hadoop-ecosystem>
- https://www.edureka.co/blog/mapreduce-tutorial/#mapreduce_word_count_example
- <https://github.com/vasanth-mahendran/weather-data-hadoop>
- <https://spark.apache.org/docs/latest/quick-start.html#more-on-dataset-operations>

Online Skill Based Courses

Sr. No.	Course Code	NPTEL Course	Name of Course Coordinator	Coordinating Institute	Duration	No. of Credits
1	ECO23101B	Programming, Data Structure & Algorithms using Python	Prof. Madhavan Mukund	Chennai Mathematical Institute	8 Weeks	2

Introduction to IT Workshop (ECO23102)		
Teaching Scheme: TH: 00 Hrs./Week PR: 04 Hrs./Week	Credits 02	Examination Scheme: Course activity: 10 Marks Term work : 20 Marks Oral exam : 30 Marks
Prerequisite Courses, if any: Students are expected to have a good understanding of basics of computer fundamentals.		
Companion Course, if any: No		
Course Objectives: <ol style="list-style-type: none"> 1. The IT Workshop for engineers is a training lab course spread over 60 hours. 2. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher. 		
Course Outcomes: On completion of the course, learner will be able to – <ol style="list-style-type: none"> 1. Perform Hardware troubleshooting 2. Understand Hardware components and inter dependencies 3. Safeguard computer systems from viruses/worms 4. Document/ Presentation preparation 5. Perform calculations using spreadsheets 		
Course Contents		

Introduction

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructor should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browser to block pop ups, block active x downloads to avoid viruses and /or worms.

Latex and Word

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in

both LaTeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Powerpoint

Task 1: Students will be working on basic power point utilities and tools which help them create basic powerpoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

Reference Books:

1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education*.
4. PC Hardware - A Handbook – Kate J. Chase *PHI (Microsoft)*
5. LaTeX Companion – Leslie Lamport, *PHI/Pearson*.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – *CISCO Press, Pearson Education*.

Subject: Internship / Apprenticeship (ECO23103)		
Teaching Scheme: TH: - PR:- 25 Hrs./week	Credits:04	Examination Scheme Course Activity: 50 Marks Term-Work : 50 Marks Oral Exam : 30 Marks

Course Objectives:

- To expose to the industrial environment, and acquire professional experience.
- To understand real life problems and understand problem solving approach in industry.
- To create awareness of various tools and technologies used in industries for various applications.
- To cultivate professional and societal ethics and familiarize with various social, economic and administrative considerations in the working environment of industry/ organizations.

Course Outcomes: On completion of the internship, learner will be able –

- **CO1:** To demonstrate professional competence through internship.
- **CO2:** To apply experience gained through internships for academic activities in a professional manner.
- **CO3:** To identify appropriate tools and technology to solve given problem.
- **CO4:** To demonstrate abilities of responsible professional and societal ethics in their day-to-day life.

Guidelines to the students:

Any absenteeism by students during their internship should be informed immediately to the mentor/coordinator and the HOD. No special considerations will be accepted. Student cannot take leave fest activities. The monthly attendance should be duly submitted to the HOD by the student.

Internship Diary / Internship Workbook:

Student must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The student should record in the daily training diary account of the observations, impressions, information gathered and suggestions given, if any. The training diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working.

Internship Diary/workbook and Internship Report should be submitted by the student along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. Internship Diary / workbook may be evaluated on the basis of the following criteria:

- Proper and timely documented entries.
- Adequacy and quality of information recorded
- Attitude & Behavior at work.
- Thought process and recording techniques used.
- Organization of the information.

Internship Report:

The report shall be presented covering following recommended fields but limited to:

- Title/Cover Page
- Internship completion certificate.
- Internship Place Details- Company background-organization and activities/Scope and object of the study / personal observation.
- Index/Table of Contents
- Introduction
- Title/Problem statement/objectives
- Motivation/Scope and rationale of the study
- Methodological details
- Results / Analysis /inferences and conclusion
- Suggestions / Recommendations for improvement to industry, if any
- Attendance Record
- List of reference (Library books, magazines and other sources)

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**Syllabus: Second Year (SY B. Tech.) Computer Engineering
w.e.f. AY:2023-2024**

Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks							Credits			
		TH	PR	TUT	ACT	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
ECO23201	Skill Based Courses (Online/Offline)		4		10			20		30			2		
ECO23202	Work Based Voc. Courses (Online/Offline)		4		10			20		30			2		
ECO23203	Internship		25		50			50		30			4		
Total					70			90		90			8		

Skill Based Courses (Online/Offline)		Work Based Voc. Courses (Online/Offline)	
ECO23201	Hardware Troubleshooting	ECO23202	Digital Marketing (Online)

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Introduction to Hardware Troubleshooting (ECO23201)

Teaching Scheme:

TH: 00 Hrs./Week

PR: 04 Hrs./Week

Credits

02

Examination Scheme:

Course activity: 10 Marks

Term work : 20 Marks

Oral exam : 30 Marks

Prerequisite Courses, if any: Students are expected to have a good understanding of basics of computer and troubleshooting.

Companion Course, if any: No

Course Objectives:

1. Understand the importance of basic computer knowledge.
2. Familiarize participants with the Hardware and software components.
3. Explore Hands-On knowledge with practices

Course Outcomes: On completion of the course, learner will be able to –

1. Ability to develop knowledge about the basics of computer.
2. Ability to handle hardware and software components.
3. Students will able to handle and troubleshoot the basic computer and its network.
4. Students will get administrate opportunity.

Course Contents

Computer and Functions

Computer Components- hardware and software components, Hardware components- Input device and Output Device Difference between Monitors –CRT, LCD, LED, About CPU- ALU, CU, Registers, Memory-Primary Memory and Secondary Memory Primary Memory -RAM,ROM, Secondary Memory-HD, Optical Disks, Software-System S/W and Application S/W Units of Measurements Storage Management-Bit, Byte, KB,MB,GB,TB, Understand the concept how computer work, take data as I/p devices, it process, confirm send to as O/P or storage for future use., Speed Measurements Hz, MHZ, Ghz. How CPU speed measure. Computer Classification- Types, Computer Characteristics

Computer Motherboard

Microprocessor, RAM slots, PCI slots, CMOS battery, Chipset, Capacitors, Power Cable and data cables in side CPU – SATA, PATA

CPU Components

Keyboard and mouse, Printer, VGA, USB ports, LAN slot, Sound Slots- 3

System Configuration and use

Need to set Computer name, workgroup, Display properties – Resolution settings, screen saver etc. How to create users and their security, Network Settings – Set IP address, subnet mask. Default gateway, DNS server Sharing files and folders, Browser Settings – Proxy, History etc., Network Troubleshooting- LAN settings checking, Cable hardware problem check, browser settings checking, Ping command, ipconfig/all command, BIOS settings – Date and time,

USB disable/unable, Boot sequence, BIOS security etc.

Computer Network Fundamentals

Computer Network, Topology – Physical and Logical, Topology Types=Mesh, Star, Ring, Bus, Tree, Hybrid, Network Types – LAN, WAN, VPN, PAN, MAN basic only theory, Networking Model OSI, Network Adaptors – about adaptors, Introducing protocols – how protocols used in OSI layers., Cables–VGA, DVI, HDMI,PS/2, Ethernet, sound cable, USB cable, power cord, LAN cables, Cables used in Networks – UTP, STP, LAN Cables - Straight Through and Cross Over cable practical

Online Skill Based Courses

Sr.No.	Course Code	NPTEL Course	Name of Course Coordinator	Coordinating Institute	Duration	No. of Credits
1	ECO23202	Digital Marketing	Shainesh G	Indian Institute of Management Bangalore	6 Weeks	2

Subject: Internship / Apprenticeship (ECO23203)		
Teaching Scheme: TH: - PR:- 25 Hrs./week	Credits:04	Examination Scheme Course Activity: 50 Marks Term-Work : 50 Marks Oral Exam : 30 Marks

Course Objectives:

- To expose to the industrial environment, and acquire professional experience.
- To understand real life problems and understand problem solving approach in industry.
- To get awareness of various tools and technologies used in industries for various applications.
- To cultivate professional and societal ethics.
- To familiarize with various social, economic and administrative considerations in the working environment of industry/ organizations.

Course Outcomes: On completion of the internship, learner will be able –

- **CO1:** To demonstrate professional competence through internship.
- **CO2:** To apply experience gained through internships for academic activities in a professional manner.
- **CO3:** To identify appropriate tools and technology to solve given problem.
- **CO4:** To demonstrate abilities of responsible professional and societal ethics in their day-to-day life.
- **CO5:** To create network and social circle, and develop relationships with industry.

Guidelines to the students:

Any absenteeism by students during their internship should be informed immediately to the mentor/coordinator and the HOD. No special considerations will be accepted. Student cannot take leave fest activities. The monthly attendance should be duly submitted to the HOD by the student.

Internship Diary / Internship Workbook:

Student must maintain Internship Diary/ Internship Workbook. The main purpose of maintaining diary/workbook is to cultivate the habit of documenting. The student should record in the daily training diary account of the observations, impressions, information gathered and suggestions given, if any. The training diary/workbook should be signed after every day by the supervisor/ in charge of the section where the student has been working.

Internship Diary/workbook and Internship Report should be submitted by the student along with attendance record and an evaluation sheet duly signed and stamped by the industry to the Institute immediately after the completion of the training. Internship Diary / workbook may be evaluated on the basis of the following criteria:

- Proper and timely documented entries.
- Adequacy and quality of information recorded
- Attitude & Behavior at work.
- Thought process and recording techniques used.
- Organization of the information.

Internship Report:

The report shall be presented covering following recommended fields but limited to:

- Title/Cover Page
- Internship completion certificate.
- Internship Place Details- Company background-organization and activities/Scope and object of the study / personal observation.
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- Attendance Record
- List of reference (Library books, magazines and other sources)


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**Syllabus: Third Year (TY B. Tech.) Computer Engineering
w.e.f. AY:2023-2024**

Course Code	Courses Name	Teaching Scheme			Examination Scheme and Marks							Credits			
		TH	PR	TUT	ACT	ISE	ESE	TW	PR	OR	Total	TH	PR	TUT	Total
ECO23301	Skill Based Courses (Online/Offline)		4		10			20		30			2		
ECO23302	Work Based Voc. Courses (Online/Offline)		4		10			20		30			2		
ECO23303	Internship		25		50			50		30			4		
Total					70			90		90			8		

Skill Based Courses (Online/Offline)		Work Based Voc. Courses (Online/Offline)	
ECO23301	Introduction to Flutter	ECO23302	Data Mining (Online)

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Introduction to Flutter (ECO23301)		
Teaching Scheme: TH: 00 Hrs./Week PR: 04 Hrs./Week	Credits 02	Examination Scheme: Course activity: 10 Marks Term work : 20 Marks Oral exam : 30 Marks
Prerequisite Courses, if any: Students are expected to have a good understanding of basics of programming language.		
Companion Course, if any: No		
Course Objectives: <ol style="list-style-type: none"> 1. Learn about the features and installation of Flutter 2. Learn about the basic programming constructs of Dart 3. Develop simple mobile applications in Flutter 4. Develop mobile applications using database Connections 		
Course Outcomes: On completion of the course, learner will be able to – <ol style="list-style-type: none"> 1. Install Flutter in Android Studio 2. Build simple Flutter application using simple widgets and layouts 3. Build Animation on Flutter 4. Develop Flutter applications using Dart packages 		
Course Contents		
Introduction UNIT I Introduction to Flutter Features of Flutter- Advantages of Flutter- Disadvantages of Flutter. Flutter Installation Installation in Windows- Installation in Mac OS- Creating Simple Application in Android Studio - Architecture of Flutter Applications UNIT II Flutter Basics Widgets- Gestures- Concept of State- Layers- Introduction to Dart Programming-Variables and Data types- Decision Making and Loops. Functions- Object Oriented Programming. Introduction to Widgets- Widget Build Visualization UNIT III Introduction to Layouts Type of Layout Widgets- Single Child Widgets- Multiple Child Widgets- Advanced Layout Application-Introduction to Gestures- Statement Management in Flutter. Ephemeral State Management-Application State - scoped model- Navigation and Routing UNIT IV Animation on Flutter Introduction to Animation Based Classes-Work flow of the Flutter Animation- Working Application-		

Android Specific Code on Flutter- Introduction to Package- Types of Packages Using a Dart Package- Develop a Flutter Plugin Package- Accessing Rest API- Basic Concepts- Accessing Product service API

Assignments:

1. Create a simple Flutter app that displays "Hello Flutter" on the screen. Use both Stateless and Stateful widgets for different parts of the app.
2. Build a basic calculator app with buttons for digits (0-9), operators (+, -, *, /), and a result display. Implement the logic for performing basic arithmetic operations.
3. Create a weather app that fetches weather data from a free weather API. Display the current weather, temperature, and a short description.

Text Books:

1. Flutter Complete Reference: Create beautiful, fast and native apps for any device Miola, Alberto.
2. Dart Programming in Action" by Jordan Hudgens
3. Flutter Development Cookbook" by Paul Deitel and Harvey Deitel
4. Flutter: A Complete Guide to the Flutter Framework" by Academind

Online Skill Based Courses

Sr.No.	Course Code	NPTEL Course	Name of Course Coordinator	Coordinating Institute	Duration	No. of Credits
1	ECO23302	Data Mining	Prof. Pabitra Mitra	IIT Kharagpur	8 Weeks	2

Subject: Internship / Apprenticeship (ECO23303)		
Teaching Scheme: TH: - PR:- 25 Hrs./week	Credits:04	Examination Scheme Course Activity: 50 Marks Term-Work : 50 Marks Oral Exam : 30 Marks

Course Objectives:

- To expose to the industrial environment, and acquire professional experience.
- To understand real life problems and understand problem solving approach in industry.
- To get awareness of various tools and technologies used in industries for various applications.
- To cultivate professional and societal ethics.
- To familiarize with various social, economic and administrative considerations in the working environment of industry/ organizations.

Course Outcomes: On completion of the internship, learner will be able –

- **CO1:** To demonstrate professional competence through internship.
- **CO2:** To apply experience gained through internships for academic activities in a professional manner.
- **CO3:** To identify appropriate tools and technology to solve given problem.
- **CO4:** To demonstrate abilities of responsible professional and societal ethics in their day-to-day life.
- **CO5:** To analyze various career opportunities and decide carrier goals.

Guidelines to the students:

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Internship Diary / Internship Workbook:

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Immediately after the completion of the training. Internship Diary / workbook may be evaluated on the basis of the following criteria:

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