



**iHUB DivyaSampark**



Department of Science & Technology  
Government of India

**T**  
**TIMESPRO**

**BE THE ONE THAT DATA SCIENTISTS AND  
ANALYSTS DEPEND UPON**

iHUB DivyaSampark @ IIT Roorkee  
Post Graduate Certificate Programme in  
**Data Engineering and Cloud Computing**

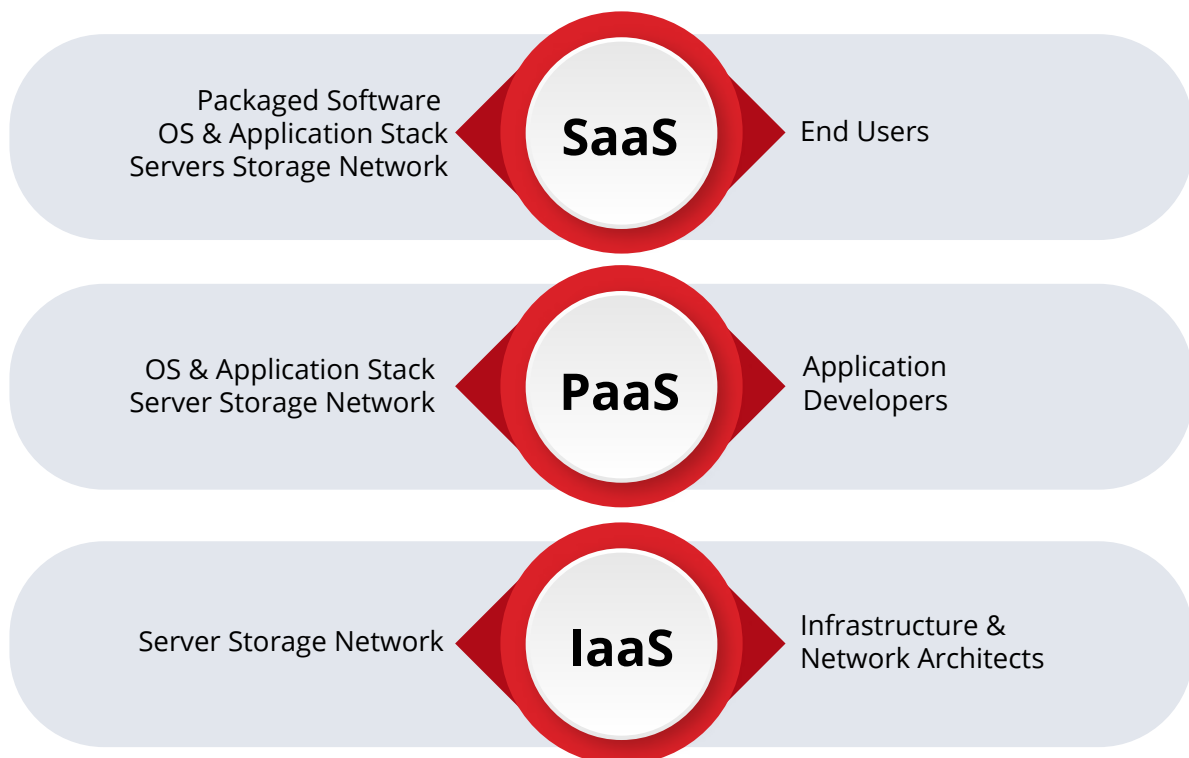
8 Months | Online | ₹1,77,000



## Cloud Computing

Simply put, cloud computing is the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet (“the cloud”) to offer faster innovation, flexible resources, and economies of scale.

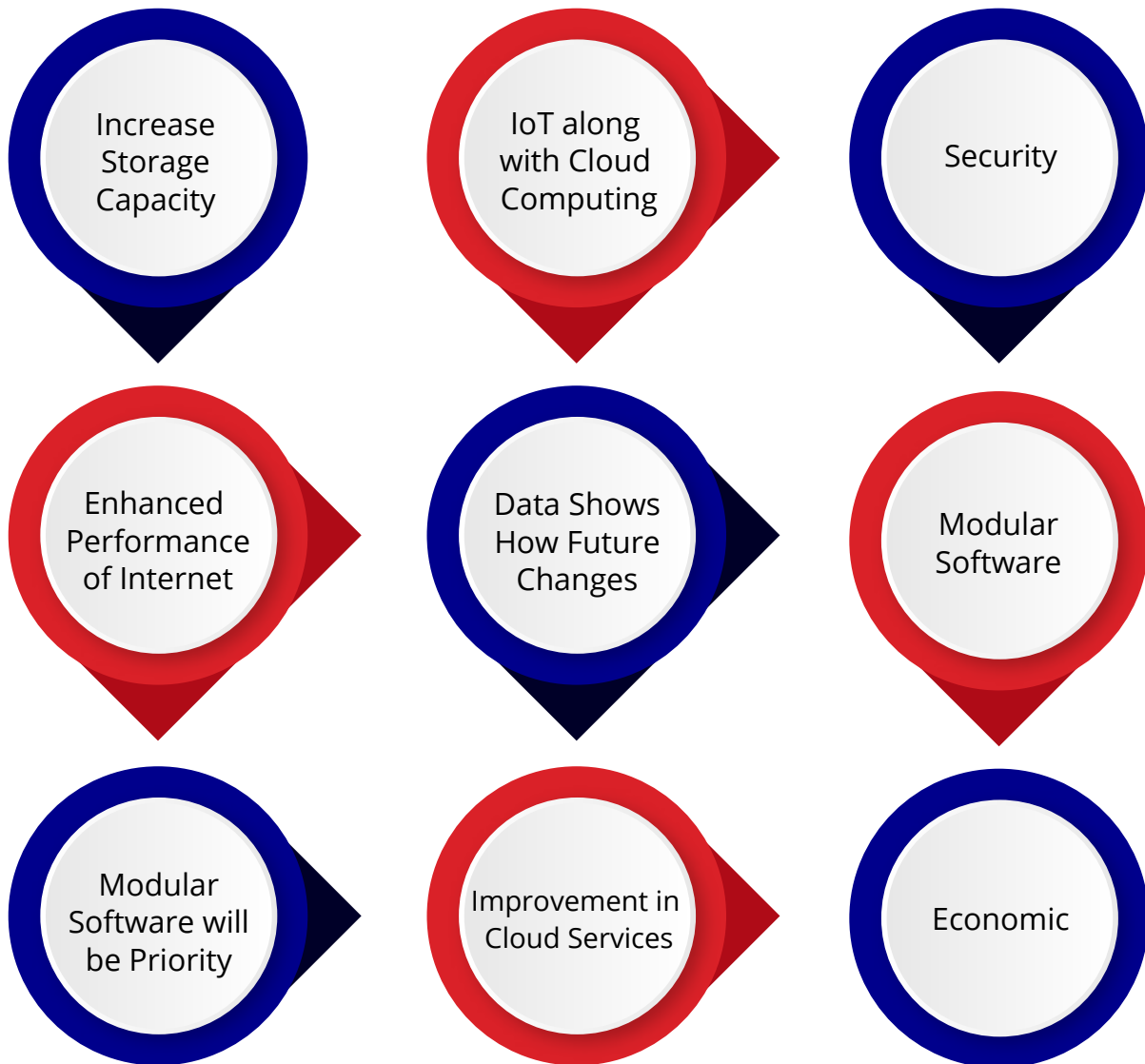
## Cloud Computing Service Models



## Cloud Deployment Models

TYPES OF CLOUD COMPUTING		
PUBLIC	PRIVATE	HYBRID
Scalable	Scalable	Scalable
Reliable	Secure	Secure
Inexpensive	Flexible	Flexible
Location Independent	Greater Control	Cost-effective

## The Future of Cloud Computing



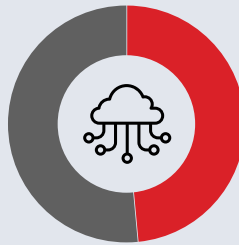
## Data Engineering

The incredible volumes of data created, generated, captured, and replicated keep growing exponentially every day. Instant data, small data, big data, real-time data, are generated every minute by an estimated 5 billion internet users worldwide, as per Statista.com. Ongoing digitisation, the impact of new technologies and the data-driven economy behind digital transformation are some of several contributors to this growth.

## DATA AGE - THE GLOBAL DATASPHERE 2025 TRENDS & DATA-READINESS FROM EDGE TO CORE

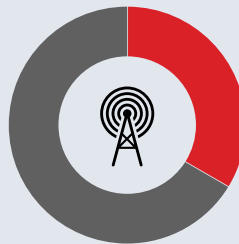
### 175 Zettabytes

The global datasphere will grow from 33 zettabytes in 2018 to 175 zettabytes by 2025. IoT devices are expected to create over 90 zettabytes of data in 2025.



### 49%

By 2025, 49% of all data worldwide will reside in public cloud environments as cloud becomes the new core.



### 30%

In 2025 nearly 30% of the world's data will need real-time processing as the role of the edge continues to grow.

IDC & Seagate Data Age 2025 - [Seagate.com/gb/en/our-story/data-age-2025/](https://www.seagate.com/gb/en/our-story/data-age-2025/)

## Data Engineering Comes Before Data Analysis

Data Engineering is the designing and building of systems for collecting, storing, and analysing data at scale. It is a broad field with applications in almost every industry. Organisations today collect massive amounts of data, and they need the right people and technology to ensure it is in a highly usable state by the time it reaches data scientists and analysts. Fields like machine learning and deep learning can't succeed without data engineers to process and channel that data.

## Data Engineering Functions



Acquire datasets that align with business needs



Collaborate with management to understand company objectives



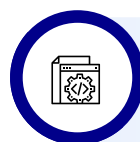
Develop algorithms to transform data into useful, actionable information



Create new data validation methods and data analysis tools



Build, test, and maintain database pipeline architectures



Ensure compliance with data governance and security policies

## Programme Overview

Data Engineering and Cloud Computing are revolutionising the way everyday business works. As per Nasscom, India will need 20 lakh tech-skilled professionals by 2025 ([analyticsindiamag.com](http://analyticsindiamag.com)). Catering to the demand in the industry - iHUB DivyaSampark and TimesPro, have come up with a Post Graduate Certificate Programme in Data Engineering and Cloud Computing. This programme covers everything from the basics and involves ample hands-on practice to get the best learning outcomes. It is an ideal programme for software professionals who wish to take up Data Engineering and Cloud Computing.



## Programme Highlights



Contextually designed  
8-month course



Peer-learning and  
networking opportunities



Focus on real-business  
use cases



Certification jointly issued  
by iHUB DivyaSampark  
and TimesPro

## Learning Outcomes



Learn about Hadoop and big data analytics using Apache  
Hive and Apache Spark



Get Hands-on knowledge in cloud computing with  
virtualisation and containerisation concepts



Learn to work with SQL and NoSQL Databases



Learn cloud security concepts

## Entrepreneurship

We encourage and support young entrepreneurs to pursue entrepreneurship as a career. Young entrepreneurs will also be able to expand their networks which not only minimizes the risk of pursuing start-ups but also offsets the opportunity costs of high-paying jobs.

## Technology Development

iHUB DivyaSampark works as a bridge between Indian academia and industry, encouraging disruptive technologies to benefit the masses by identifying the need for technology in CPS and developing a solution based on the same.

## Benefits For Everyone

### ▪ Industries

- Window to the world of technologies and Joint Development.
- Exploratory research at low risk.
- Technology Transfer.
- Access to the foreign market.
- Licensing

### ▪ Venture Capitalist & Angel Investors

- Early access to promising start-ups.
- Creating innovative economic value through co-funding opportunities.

### ▪ Researchers

- Technology Development and Entrepreneurship Support
- Networking Platform
- Industry connects and Funds

## ▪ Entrepreneurs & Start-ups'

- Entrepreneurs-In-Residence
- PRAYAS
- Incubation
- Seed-Support
- Accelerator program

## ▪ International Collaboration

- Gateway to India for technology transfer opportunities.
- Joint development of products for Indian market & beyond
- Connect with Indian Innovators & Start-ups
- Technology demand forecast for the Indian market and beyond.

*For more information, visit <https://tih.iitr.ac.in/>*





## Programme Curriculum\*

### 1. Fundamentals of Python, Linux, and SQL

### 2. Introduction to Cloud Computing

- Introduction to Cloud
- Cloud Computing at a glance
- The Cloud Computing reference model
- Deployment model characteristics and benefits
- Historical developments
- Introduction to leading service providers
- Core technologies in Cloud Development

### 3. AWS Solutions Architect Associate Level

- Getting started with AWS
- IAM & AWS CLI
- EC2 fundamentals
- EC2 instance storage
- High availability and scalability
- RDS, Aurora, ElastiCache
- Classic solutions architecture discussions
- Amazon S3 introduction & databases in AWS
- AWS DSK, IAM roles & policies
- Containers on AWS
- Serverless solutions
- AWS monitoring and audit
- AWS security & encryption
- Networking - VPC
- Disaster recovery and migration

#### **4. Virtualization and Containerisation Concepts**

- Review of concepts from operating systems
- Introduction to virtualization
- VirtualBox, virtualization reference model, virtual machine lifecycle
- Full virtualization, hardware-assisted CPU virtualization
- Paravirtualization (VMWare, KVM/QEMU, Xen Hypervisor)
- Network virtualization, storage virtualization
- Memory virtualization, I/O virtualization etc.
- Introduction to OS level virtualization and containrization
- Containers: namespaces, cgroups, frameworks
- introductin to docker, docker life cycle
- Application development using docker

#### **5. Cloud applications in Industry Automation and Cloud Based Digital Transformations**

- Cloud applications in industry automation and cloud based digital transformations

#### **6. Migration and SLA**

- SLA and Migration, VM migration techniques, design challenges, steps to migrate a VM, flavours of VM migration techniques, live migration

#### **7. Parallel Computing, Scheduling and Load Balancing**

- Introduction to parallel computing
- Distributed management of virtual infrastructures
- Dynamic provisioning and resource management
- Fundamental concepts in the design of scheduling techniques
- Types of scheduling techniques
- Load balancing, various load balancing techniques

#### **8. Cloud Security Concepts**

- Introduction to Cloud security
- Infrastructure security
- Network level security, host level security, application-level security
- Data security and storage
- Data privacy and security issues

## 9. Advanced Cloud Concepts

Advancements in Cloud and emerging Cloud computing-based technologies:

1. IoT
2. Industry 4.0
3. Mobile Cloud computing
4. Fog, mist computing
5. Edge computing
6. Integration among advanced technologies

## 10. Data Engineering

- Introduction to Data Engineering & Big Data
- Introduction to Hadoop, HDFS and map reduce
- Data analytics using Apache hive
- Working with Cloud(Microsoft Azure)
- Working with Apache spark and spark through databricks
- Data /ingestion tools – Sqoop, Flume and Kafka
- Working with NoSQL databases – Cassandra, Hbase and MongoDB
- Introduction to Big data analytics with spark ML
- Implementing ML algorithms through spark ML

## Capstone Project

## Programme Details

### Pedagogy

The teaching approach will be highly interactive and leverage technology, deploying diverse pedagogical tools and techniques, including lectures, case studies, assignments, quizzes, project work, etc.

### Programme Delivery

- The programme will be delivered in a two-way video/audio interactive mode.
- Students will attend the lectures on their own devices (Laptop/Desktop/Tablet/Mobile).
- Students will have access to a Learning Management System for referring to the content (the access will be provided for additional 6 months after programme completion).

### Programme Duration

- 8 months
- 180 hours of online learning (112 hours live online + 68 hours self-paced)
- 56 hours online sessions by faculties from various eminent Institutes.
- 56 hours online sessions by TimesPro faculty and industry experts

### Class Schedule

Every Saturday and Sunday, 10:30 a.m. to 12:30 p.m. IST

### Eligibility Criteria

- Bachelor's from any of the following streams with minimum 50% marks
  - BE/BTech CS/IT/EEE/ECE
  - BSc CS/IT, MSc CS/IT
  - BCA, MCA
- Minimum 2 years of experience in Software Development/IT

## Admission Criteria

Selection is based on student application and eligibility criteria.

## Evaluation Criteria

- Candidates need to secure minimum 50% overall to be eligible for the certificate.
- Candidate needs to maintain at least 75% attendance to be eligible for the certificate.

### Evaluation Weightage

Assignments – 40%

Capstone Project – 40%

Quizzes – 10%

Attendance – 10%



## Programme Fee

Programme Fee	GST @18%	Total Fee
₹1,50,000	₹27,000	₹1,77,000

### Note:

- \*GST (currently @ 18%) will be additional as applicable.
- All fees are payable directly to TimesPro.
- Application fees of ₹10,000 will be charged for the processing of application. The payment is done by each applicant at the time of submission of the application.
- The application fees is fully refundable in case the application is not selected for the programme.
- The application fees is non-refundable in case:
  - an applicant rejects the offer, and/or
  - an application is rejected due to incomplete information or documents requested
- In case the Applicant's profile is rejected by the Institute then the initial amount paid on registration shall be refunded subject to a deduction of INR 2,500 + GST by way of administrative charges.

## Instalment Schedule

Instalment	Date	Amount (₹)*
Application fees	At time of registration	10,000
I	Within one-week of offer-rollout	27,500
II	14 <sup>th</sup> April, 2023	37,500
III	14 <sup>th</sup> May, 2023	37,500
IV	14 <sup>th</sup> June, 2023	37,500

\*GST will be additional as applicable

**APPLY NOW** 

## Faculty Members



**Dr. Neetesh Kumar**  
Assistant professor,  
Indian Institute Of  
Technology, Roorkee

Dr. N. Kumar received his M.Tech and Ph.D. degrees from the School of Computer and Systems Sciences (SC&SS), Jawaharlal Nehru University, New Delhi, India. Currently, he is working as an Assistant Professor at Computer Science and Engineering (CSE) department, Indian Institute of Technology (IIT), Roorkee, India. One of his works received a Special Mention Award by Xerox Research Centre, Bangalore and some other works also received several best paper awards at various International Conferences. He has published several research articles in prestigious journals including IEEE transactions, Elsevier, Springer etc. He is serving as a regular reviewer for IEEE TITS, IEEE-TVT, IEEE-PDS, IEEE-TNSM, FGCS. He is acting as Lead Principal Investigator (PI) for several major research projects funded by the Government of India including the Department of Science and Technology (DST), Science & Engineering Research Board (SERB), Council of Scientific & Industrial Research (CSIR), and IIT Roorkee. He has also filed several patents for his inventions as an individual and in collaboration. He has been part of technical program committee members for several conferences. He has also been invited to present as a keynote speaker and session chair at the various conferences, Faculty Development Programs (FDPs) at IIT-BHU, IIT-Indore, IIIT Allahabad, MNNIT-Allahabad, etc. His research areas include Design and Analysis of Algorithms, IoT, High-Performance Computing (Parallel, Cloud, and Fog Computing), Applied Evolutionary Computing, Software Defined Networking, Deep Reinforcement Learning, and Intelligent Transportation Systems.



## Faculty Members



### **Dr. Yash Daultani**

ASSISTANT PROFESSOR (GRADE-I)

Operations Management

Dr. Yash Daultani is a Faculty member of the Operations Management Group. He has over six years of academic

work experience. Before joining IIM Lucknow, he was associated with ABV-IIITM Gwalior as an assistant professor. He holds a doctoral (Fellow) degree from the Indian Institute of Management Lucknow. He has published several research articles that appeared in the International Journal of Production Research, Journal of Intelligent Manufacturing, etc.



### **Dr. Devki Nandan Jha**

Postdoctoral Research

Associate, University of Oxford

Dr. Devki Nandan Jha is currently a postdoctoral research associate at Oxford e-Research Centre,

University of Oxford, under the supervision of Prof. David Wallom, University of Oxford and Mr. David Blundell, 100 Percent IT.

He received his Ph.D. in 2020 from School of Computing, Newcastle University, UK, under the supervision of Prof. Rajiv Ranjan, Prof. Paul Watson and Dr. Xiaoli Li (external from I2R A\* STAR, Singapore). His Ph.D. research focuses on an innovative approach for the deployment of microservices in cloud-edge environments.

His research interests include Cloud Computing, Internet of Things (IoT) and Machine Learning. He was also involved in design and development of multiple IoT simulators.

He is currently working on Trusted Public Cloud project where his main aim is to design and develop a trusted environment for user-specific applications executing in public cloud environment.

## Certification\*



- Candidates need to secure minimum 50% overall to be eligible for the certificate.
- Candidates need to maintain at least 75% attendance to be eligible for the certificate.

*\*All certificate images are for illustrative purposes only and may be subject to change at the discretion of iHUB DivyaSampark.*

## About iHUB DivyaSampark



iHUB DivyaSampark aims to enable innovative ecosystem in new age technologies like AI, ML, Drones, Robots, data analytics (often called CPS technologies) and becoming the source for the next generation of digital technologies, products and services by promoting, enhancing core competencies, capacity building, manpower training to provide solutions for national strategic sectors and becoming a key contributor to Digital India.

iHUB DivyaSampark a section 8 company (Non-Government Organization) is a Technology Innovation Hub, at IIT Roorkee and is set up under National mission on Interdisciplinary Cyber Physical systems (NM-ICPS), initiated by Department of Science & Technology (DST) to build innovative solutions, to train manpower and encourage entrepreneurship for the world's current challenges like affordable health care, Industry 4.0 and sustainable smart cities.

It is being coordinated by a high-level interministerial co-ordination committee headed by **Niti Aayog CEO, DST Secretary, Secretary, MeitY, Secretary, D/o Heavy Industry, Secretary, D/o Health Research and Central Line Ministries/Departments are members of this committee.**



TimesPro, the award-winning EdTech initiative of The Times Of India Group, was established in 2013 to cater to the diverse learning needs of Indians with aspirations of career growth.

Taking the rich legacy of trust, knowledge, and learning of The Times Of India Group forward, TimesPro strives to embody the values of Education 4.0 – learner-centric, industry-relevant, role-specific, and technology-enabled – in its executive education programmes.

Ranging across industries and domains, these programmes are curated and offered in collaboration with premier national and global educational institutions to fulfil the aspirations of millions of professionals by equipping them with the right knowledge and skills.



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**T**  
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