Welcome !
Introducing BITS,Pilani and WILP

Agenda

- Introducing BITS Pilani and WILP

- Academic Guidelines

- M.Tech (DSE) - Programme Overview

- M.Tech (DSE) - Operations

- Question & Answer

Welcome !
Introducing BITS,Pilani and WILP

Brief history

... "degree-granting college" in 1943, and to ...

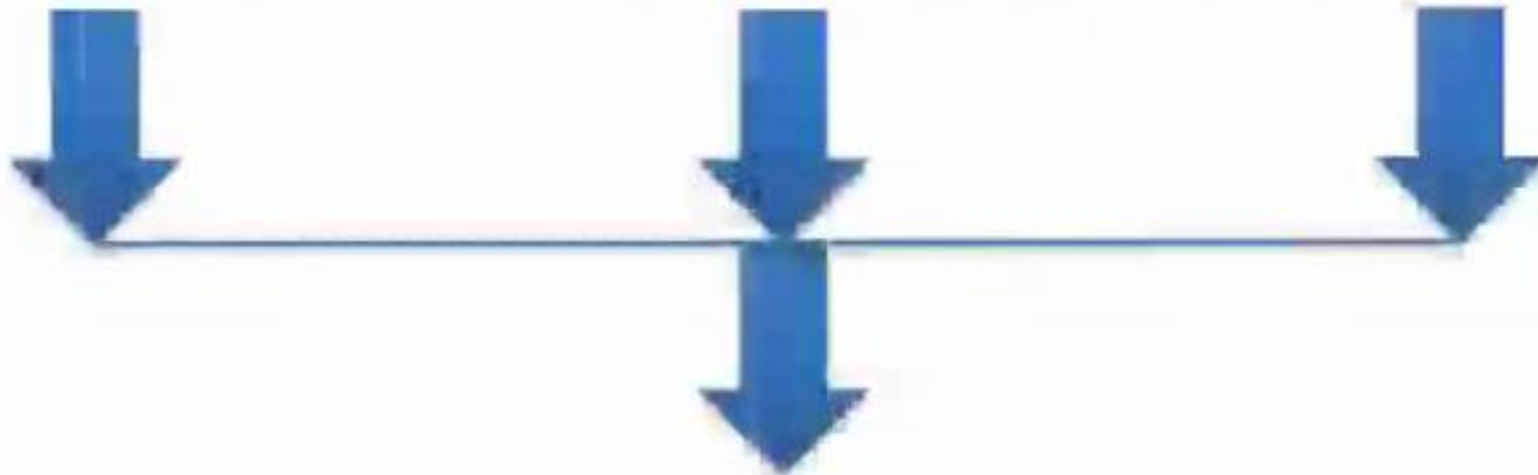... to a university, BITS Pilani in 1964

Brief history

Birla College of Engg.
(established 1946)

Birla College of Arts
(established 1943)

Birla College of Sc.,
Commerce & Pharmacy
(established 1943/1950)

Birla Institute of Technology & Science Pilani (or BITS Pilani)

(university status bestowed by University Grants Commission in 1964)

BITS' journey, since 1964

- Collaboration with MIT, with Ford Foundation grant (mid-1960s)
- Pioneered modern system of education in mid-60s (first in India, together with IIT Kanpur)
  - Credits-based, semester system, since mid-1960s
  - Continuous and internal evaluation
  - Science-based curriculum
- Pioneered 7.5-months industry practice, since early 1970s
- Pioneered training of working professionals from industry
  - Through "Work-Integrated Learning Programme", since 1970s
  - Largest in India (with 20,000++ industry professionals)
- Pioneered online test for admissions, since 2005

History

Pilani Dubai Goa Hyderabad

- Deemed to be University established under Sec. 3 of UGC Act 1956 (1964)
- Privately funded
- Accredited by NAAC with 5 star rating (2000), A grade (2009 and 2016)
- IoE (2018)

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Pilani | Dubai | Goa | Hyderabad

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Leader in Industry Engagement

BITS Pilani is widely regarded as the pioneer in the field of University-Industry linkages through its off campus programmes.

WILP Programs at a Glance

		Learner Profile			
		10+2 Students	**Technical Diploma Holders**	**B.Sc./ BCA Graduates**	**BE/ B.Tech. Graduates**
Industry	**IT & EEE**	B.Sc (Design and Computing)	B.Tech. Information Systems	Integrated M.Tech. Software Systems Integrated M.Tech. Computing Systems & Infrastructure	M.Tech. Software Systems M.Tech. Computing Systems & Infrastructure M.Tech. Embedded Systems M.Tech. Microelectronics Post Graduate Programme in Internet of Things Post Graduate Programme in AI/ML
	Data Sciences	-	-	M.Sc. Business Analytics	M.Tech. Data Science & Engineering M.Sc. Business Analytics Post Graduate Programme in Big Data Engg
	Manufacturing	-	B.Tech. Manufacturing Technology B.Tech. Process Engineering B.Tech. Power Engineering B.Tech. Engineering Design	B.Tech. Manufacturing Technology B.Tech. Process Engineering B.Tech. Power Engineering B.Tech. Engineering Design	M.Tech. Design Engineering M.Tech. Manufacturing Management M.Tech. Quality Management M.Tech. Automotive Engineering M.Tech. Transportation Engineering M.Tech. Digital Manufacturing M.Tech. Automotive Electronics
	Pharma / Healthcare	B.Sc (Pharmaceutical Sciences)	B.Tech. Process Engineering	B.Tech. Process Engineering	M.Tech. Pharmaceutical Operations & Management
	Management	-	-	MBA in Consultancy Management MBA in Finance Post Graduate Diploma in Finance	MBA in Manufacturing Management MBA in Quality Management MBA in Consultancy Management MBA in Hospital & Health Systems Management MBA in Finance Post Graduate Diploma in Finance

Academic Guidelines

WILP Programs at a Glance

		Learner Profile			
		10+2 Students	Technical Diploma Holders	B.Sc./ BCA Graduates	BE/ B.Tech. Graduates
Industry	IT & EEE	B.Sc (Design and Computing)	B.Tech. Information Systems	Integrated M.Tech. Software Systems Integrated M.Tech. Computing Systems & Infrastructure	M.Tech. Software Systems M.Tech. Computing Systems & Infrastructure M.Tech. Embedded Systems M.Tech. Microelectronics Post Graduate Programme in Internet of Things Post Graduate Programme in AI/ML
	Data Sciences	-	-	M.Sc. Business Analytics	M.Tech. Data Science & Engineering M.Sc. Business Analytics Post Graduate Programme in Big Data Engg
	Manufacturing	-	B.Tech. Manufacturing Technology B.Tech. Process Engineering B.Tech. Power Engineering B.Tech. Engineering Design	B.Tech. Manufacturing Technology B.Tech. Process Engineering B.Tech. Power Engineering B.Tech. Engineering Design	M.Tech. Design Engineering M.Tech. Manufacturing Management M.Tech. Quality Management M.Tech. Automotive Engineering M.Tech. Transportation Engineering M.Tech. Digital Manufacturing M.Tech. Automotive Electronics
	Pharma / Healthcare	B.Sc (Pharmaceutical Sciences)	B.Tech. Process Engineering	B.Tech. Process Engineering	M.Tech. Pharmaceutical Operations & Management
	Management	-	-	MBA in Consultancy Management MBA in Finance Post Graduate Diploma in Finance	MBA in Manufacturing Management MBA in Quality Management MBA in Consultancy Management MBA in Hospital & Health Systems Management MBA in Finance Post Graduate Diploma in Finance

Academic Guidelines

- 2 year, 4 semester programme

Year		First Semester	U		Second Semester	U
I	DSE* ZC415	Data Mining	3	DSE* ZC413	Introduction to Statistical Methods	3
	DSE* ZC416	Mathematical Foundations for Data Science	4	DSE* ZG523	Introduction to Data Science	3
	DSE* ZG519	Data Structures and Algorithms Design	5		Elective –I	
	DSE* ZG516	Computer Organization & Software Systems	5		Elective-II	
		Total	17		Total	15 (min)
II	Elective-III					
	Elective-IV			DSE*ZG628T	Dissertation	16
	Elective-V					
	Elective-VI		16 (min)			16

- Each unit corresponds to about 30 hrs of effort
- Dissertation is of 16 units, standalone
- Click for sample handout

Sample Course Handout

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
WORK INTEGRATED LEARNING PROGRAMMES

COURSE HANDOUT

Part A: Content Design

Course Title	Mathematical Foundations for Data Science
Course No(s)	DSECL ZC416
Credit Units	4
Course Author	G Venkiteswaran
Version No	3
Date	15.04.2021
Lead Instructor	G Venkiteswaran

Course Description

Vector and matrix algebra, systems of linear algebraic equations and their solutions; eigenvalues, eigenvectors and diagonalization of matrices; Calculus and optimization; Counting principles and combinatorics

Course Objectives

No	Objective- The course aims to
CO1	Introduce concepts in linear algebra and to use it as a platform to model physical problems.
CO2	Provide techniques for analytical and numerical solutions of linear equations

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
WORK INTEGRATED LEARNING PROGRAMMES

COURSE HANDOUT

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Course Objectives

No	Objective- The course aims to
CO1	Introduce concepts in linear algebra and to use it as a platform to model physical problems.

	• Eigenvalues and eigenvectors of special matrices and their properties • Eigenbases and diagonalization • Gerschgorin's Theorem • Power Method	
5-6	Decomposition methods (Eigenvalue, decomposition, QR and SVD) • Gram-Schmidt Orthogonalization procedure • QR decomposition • SVD • Dimensionality reduction	T1: Sec 20.9 Class notes
7 -8	Application of linear algebra in optimization. Modelling linear programming problem and the basics of Simplex algorithm and sensitivity analysis. • Model a LPP in construction of buildings. • Model the currency arbitrage optimization problem. • Work out the graphical method of solution in the case of 2 variable case • Simplex method for simple cases • Outline how Gauss Jordan produces the inverse matrix.	Class notes
9	Properties of functions • Continuous functions on closed intervals.	Class notes

- Gram-Schmidt Orthogonalization procedure
- QR decomposition
- SVD
- Dimensionality reduction

		Class notes
7-8	Application of linear algebra in optimization. Modelling linear programming problem and the basics of Simplex algorithm and sensitivity analysis. • Model a LPP in construction of buildings. • Model the currency arbitrage optimization problem. • Work out the graphical method of solution in the case of 2 variable case • Simplex method for simple cases • Outline how Gauss Jordan produces the inverse matrix.	Class notes
9	Properties of functions • Continuous functions on closed intervals, differentiation (1d case) • Taylor series expansion • Maxima and minima • Integral properties (cdf and pdf, even and off integrands, integration by parts and so on) for 1d	Class notes
10	Calculus of several variables • Review limits, continuity and differentiability	Class notes

Examination

- Online Examination
  - Hall ticket
  - Mock test
- Mid Semester
  - Open Book
  - 120 Mins
- Comprehensive Exams
  - Open Book
  - 120 Mins
- Makeups
  - Granted in genuine cases
  - Process to apply for makeups will be shared through canvas
  - Not to be considered as a grade improvement exam

Grading & CGPA

Letter Grade	Grade Point	Qualitative grade (dissertation)
A	10	Excellent
A-	9	Very Good
B	8	Good
B-	7	Above Average
C	6	Fair/Average
C-	5	Below average
D	4	Poor
E	2	Exposed (consider as failed)
RRA	0	Required to Register Again

DSE* ZC415	Data Mining	3
DSE* ZC416	Mathematical Foundations for Data Science	4
DSE* ZG519	Data Structures and Algorithms Design	5
DSE* ZG516	Computer Organization and Systems Software	5

DM ☐☐ B- (7)
MFDS ☐☐ A (10)
DSAD ☐☐ B (8)
COSS ☐☐ C (6)
GPA = (7*3+10*4+8*5+6*5)/17
     = 7.70

Grading

- Relative grading
- Students with less than 5.5 CGPA and having "E" / "RRA" grade in one or more courses cannot register for Dissertation
- **It is mandatory to attend Mid Semester and Comprehensive Exams to be eligible for grading.**
  - RRA Grade : Awarded in cases where a student is not evaluated on a mandatory component
  - In such cases [RRA's, E Grades, CGPA < 5.5], students must re-register for courses [backlog courses] to improve
  - Limit on maximum number of courses per semester including backlog courses - subject to individual performance

Academic Guidelines

Year		First Semester	U		Second Semester	U
I	DSE* ZC415	Data Mining	3	DSE* ZC413	Introduction to Statistical Methods	3
	DSE* ZC416	Mathematical Foundations for Data Science	4	DSE* ZG523	Introduction to Data Science	3
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	DSE* ZG516	Computer Organization & Software Systems	5		Elective-II	
		Total	17		Total	15 (min)
II	Elective-III			DSE*ZG628T	Dissertation	16
	Elective-IV					
	Elective-V					
	Elective-VI		16 (min)			16

- Electives must be chosen among the ones offered so that the minimum unit requirements are met.
- At the end of third semester,
  - (1) coursework for the minimum of 48 (17+15+16) units must be completed
  - (2) CGPA $\geq$ 5.5
  - (3) in all the registered courses , student must have earned a grade from {A,A-,B,B-,C, C-,D,D-}

to proceed to the fourth semester (dissertation)

Academic Guidelines

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	DSE* ZG519	Data Structures and Algorithms Design	5		Elective –I	
	DSE* ZG516	Computer Organization & Software Systems	5		Elective-II	
		Total	17		Total	15 (min)
II	Elective-III					
	Elective-IV			DSE*ZG628T	Dissertation	16
	Elective-V					
	Elective-VI		16 (min)			16

- What if the minimum requirements are not met at the end of third semester?
  - Repeat all the courses where the grade is RRA/ E and obtain a grade in {A,A-,B, B-, C,C-, D}
  - If CGPA is less than 5.5 and all the courses have grades in {A,A-,B, B-, C,C-, D}
    - repeat one or more courses [as advised by the institute] where the grades are poor and improve the grades
- Student will proceed to fourth semester of the program only after meeting the minimum requirements mentioned

Academic Guidelines

Year		First Semester	U		Second Semester	U
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	Elective-IV					
	Elective-V					
	Elective-VI		16 (min)			16

- Graduation Requirements
  - Completing courses (core + electives) upto semester 3 meeting requirements
  - Successful completion of dissertation -
    - Grades - { Excellent, Good, Fair, Poor } and not RRA

Major Academic Processes

- Registration

- Certificates

  - **Grade sheet** will be issued at the end of each semester - through canvas - soft copy

  - **Transcript** and **Provisional Certificate** will be issued at the end of the programme (~ 2 months)

  - Finally, **Degree Certificate** will be issued (~ 6 months)

- Feedback

Recommendations

- Plan of study

- Attendance

- Continuous evaluation

- Importance of dissertation

- Ethics and etiquette

- Help Desk for raising support tickets

Program Overview

M.Tech (DSE) Programme Overview

An Inter-disciplinary field comprising Computer Science and Engineering & Statistics

Data (i.e. understanding, analysing, and using data) is the focus. Topics would span:

- (1) Learning how data drives (decisions in) the world, and
- (2) Algorithmic and computational techniques for data collection, storage, and retrieval, as well as data-driven decision making and applications

Curriculum :

- (1) Strong foundation in mathematics, necessary statistical techniques
- (2) Computing techniques and algorithms for data analysis
- (3) Systems development for a data-driven application pipeline

M.Tech (DSE) Programme Overview

Program Structure

Year	First Semester		U	Second Semester		U
I	DSE* ZC415	Data Mining	3	DSE* ZC413	Introduction to Statistical Methods	3
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II	Elective-III			DSE*ZG628T	Dissertation	16
	Elective-IV					
	Elective-V					
	Elective-VI		16 (min)			16

Note:

Elective -I is	DSE* ZG565 - Machine Learning	- 4U
Elective -III is	DSE* ZG524 - Deep Learning	- 4U

M.Tech (DSE) Programme Overview

Other Electives on the offer

DSE* ZG557 - Artificial and Computational Intelligence -5U

DSE* ZG525 - Natural Language Processing - 3U

DSE* ZG537 - Information Retrieval - 4U

DSE* ZG521 - Graphs - Algorithms and Mining - 5U

DSE* ZC556 - Stream Processing and Analytics - 5U

DSE* ZG522 - Big Data Systems - 5U

DSE* ZG517 - Systems for Data Analytics - 5U

DSE* ZG555 - Data Visualization and Interpretation -5U

DSE* ZG526 - Probabilistic Graphical Models - 4U

M.Tech (DSE) Programme Overview

Program Structure

Year		First Semester	U		Second Semester	U
I	DSE* ZC415	Data Mining	3	DSE* ZC413	Introduction to Statistical Methods	3
	DSE* ZC416	Mathematical Foundations for Data Science	4	DSE* ZG523	Introduction to Data Science	3
	DSE* ZG519	Data Structures and Algorithms Design	5		Elective –I ML	
	DSE* ZG516	Computer Organization & Software Systems	5		Elective-II	
		Total	17		Total	15 (min)
II	Elective-III DL			DSE*ZG628T	Dissertation	16
	Elective-IV					
	Elective-V					
	Elective-VI		16 (min)			16

Note:

Elective -I is	DSE* ZG565 - Machine Learning	- 4U
Elective -III is	DSE* ZG524 – Deep Learning	- 4U

M.Tech (DSE) Programme Overview

Other Electives on the offer

DSE* ZG557 - Artificial and Computational Intelligence   -5U

DSE* ZG525 - Natural Language Processing   - 3U

DSE* ZG537 - Information Retrieval   -
4U

DSE* ZG521 - Graphs - Algorithms and Mining   - 5U

DSE* ZC556 - Stream Processing and Analytics   - 5U

DSE* ZG522 - Big Data Systems
           - 5U

DSE* ZG517 - Systems for Data Analytics   -
5U

DSE* ZG555 - Data Visualization and Interpretation   -5U

DSE* ZG526 - Probabilistic Graphical Models   - 4U

M.Tech (DSE)
Programme Overview

Program Structure

Year		First Semester		U		Second Semester	U
I	DSE* ZC415	Data Mining	✓ ✓	3	DSE* ZC413	Introduction to Statistical Methods ✓	3
	DSE* ZC416	Mathematical Foundations for Data Science ✓		4	DSE* ZG523	Introduction to Data Science ✓	3
	DSE* ZG519	Data Structures and Algorithms Design ✓		5		Elective –I **ML**	
	DSE* ZG516	Computer Organization & Software Systems ✓ ✓		5		Elective-II	
		Total		17		Total	15 (min)
II	Elective-III	**DL**			DSE*ZG628T	Dissertation	16
	Elective-IV						
	Elective-V						
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Note:

Elective –I is   DSE* ZG565 - Machine Learning ✓   - 4U

Elective –III is   DSE* ZG524 - Deep Learning ✓   – 4U

M.Tech (DSE)
Programme Overview

Other Electives on the offer

DSE* ZG557 - Artificial and Computational Intelligence   -5U — 2

DSE* ZG525 - Natural Language Processing   - 3U

DSE* ZG537 - Information Retrieval   -
4U

DSE* ZG521 - Graphs - Algorithms and Mining   - 5U

DSE* ZC556 - Stream Processing and Analytics   - 5U

DSE* ZG522 - Big Data Systems
   - 5U

DSE* ZG517 - Systems for Data Analytics   - — 2
5U

DSE* ZG555 - Data Visualization and Interpretation   -5U — 2

DSE* ZG526 - Probabilistic Graphical Models   - 4U

M.Tech (DSE)
Programme Overview

- **Assignments**
  - Students will work in a virtual group of three, as assigned by the backend using some constraints.
- **Quizzes**
  - Quizzes are online for all the courses. Each quiz will be evaluated for 5%.
- Timelines for quizzes and assignments to be announced by the IC for each courses.

Units and Courses	Quiz	Assignment	Mid Sem Exam (Closed Book)	End Semester Exam (Open Book)	Total
3 Unit Courses	10	10	30	50	100
4 Unit Courses	10	20	30	40	100
5 Unit Courses	5	25	30	40	100

M.Tech (DSE) Programme Overview

Faculty	Pedagogical Tools/Techniques	Evaluation

• Drawn from industry and academia	• Experiential learning
	   – Assignments, case studies, lab exercises
	 • Collaborative learning
	   – Group activities & exercises
		• Quiz
		 • Lab, Assignments, Projects
		 • Mid semester exam
		 • End semester exam

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M.Tech (DSE) Programme Overview

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- Drawn from industry and academia
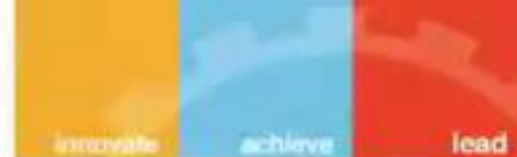
- **Experiential learning**
  - Assignments, case studies, lab exercises
- **Collaborative learning**
  - Group activities & exercises

- Quiz

- Lab, Assignments, Projects

- Mid semester exam
- End semester exam

M.Tech (DSE)
Programme Overview

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5 Unit Courses	5	25	30	40	100

M.Tech (DSE)
Programme Overview

- Python, programming language of choice for all the courses
- Optional Course on 'Introduction to Python for Data Science'
  - Recorded sessions are shared through the canvas for your personal reference.
  - No evaluation for this course - not a part of formal course package
- Designed to give an overview of Python and some of python libraries used in courses
  - Python will not be taught as programming language as a part of any other course
  - No evaluation components. Exercises will be given for practice purposes.

Program Operation

Schedules – Program Timelines – [Tentative]

Semester #1	October, 2021	March 2022
Semester #2	April, 2022	September, 2022
Semester #3	October, 2022	March, 2023
Semester #4	April, 2023	September, 2023

Schedule - Lecture Sessions

- Classes will be held over weekends through online mode
- 4 sessions / day
  - Class #1: 8:45 AM to 10:45 AM
  - Class #2: 11:00 AM to 01:00 PM
  - Class #3: 2:00 PM to 4:00 PM
  - Class #4: 4:15 PM to 6:15 PM
- Each course will be offered in multiple sections. Students will be allotted a section for a course. Sections will be allotted in such a way that a student attends all the classes either on Saturday or Sunday
- Sessions will be recorded and posted in the course page for reference.

People involved in the Course Delivery

- Instructor - in - Charge (IC)
  - Leads the course delivery
- Instructors
- Teaching Assistants

Led by IC			
Sec: Sat #1	Sec: Sat #2	Sec: Sun #1	Sec: Sun #2
Instructor #1	Instructor #2	Instructor #3	Instructor #4
Supported by Teaching Assistants			

People involved in the Course Delivery

- Semester #2

Session	Saturday	Sunday
1	Core Course	Core Course
2	Core Course	Core Course
3	Core Course	Core Course
4	Electives - ACI / DVI / [SDA*]	Electives - ACI / DVI / [SDA*]

People involved in the Course Delivery

- **Instructor - in - Charge (IC)**
  - Leads the course delivery
- **Instructors**
- **Teaching Assistants**

Led by IC			
Sec: Sat #1	Sec: Sat #2	Sec: Sun #1	Sec: Sun #2
Instructor #1	Instructor #2	Instructor #3	Instructor #4
Supported by Teaching Assistants			

People involved in the Course Delivery

- Semester #2

Session	Saturday	Sunday
1	Core Course	Core Course
2	Core Course	Core Course
3	Core Course	Core Course
4	Electives - ACI / DVI / [SDA*]	Electives - ACI / DVI / [SDA*]

People involved in the Course Delivery

- Semester #3
  - 7 electives
  - We do not guarantee that all four courses/sections of their choice can be taken on the same day.

Code	Title	Saturday Slot #1	Saturday Slot #2	Sunday Slot #1
DSECLZG526	Probabilistic Graphical Models	2:00:00 PM [PGM #1]		No Sunday Section
DSECLZG537	Information Retrieval	4:15:00 PM [IR #1]		2:00 PM [IR #2]
DSECLZG522	Big Data Systems	4:15 PM [BDS #1]		2:00 PM [BDS #2]
DSECLZG556	Steam Processing and Analytics	2:00 PM [SPA #1]		4:15 PM [SPA #2]
DSECLZG521	Graphs - Algorithms and Mining	2:00 PM [GAM #1]		4:15 PM [GAM #2]
DSECLZG525	Natural Language Processing	9:00 AM [NLP #1] 9:00 AM [NLP #2]		9:00 AM [NLP #3]
DSECLZG524	Deep Learning	11:15 AM [DL #1] 11:15 AM [DL #2]		11:15 AM [DL #3]

This table is only for representation. Actual schedule will be different from this.

Schedules –Tutorial, evaluation components

- **Tutorials / Webinar Sessions**
  - 4 sessions of 90 mins for each course
    - Recitation of topics, problem solving will be the focus of the sessions
    - Typically delivered by Teaching Assistants, attached to the course
    - On Tuesday / Thursday from 7:00 PM to 8:30 PM
    - Sessions will be recorded and posted for later reference.
- **Mid Semester (120 Mins / course), Comprehensive Exams (120 Mins / course) - online:**
  - Schedules to be announced at the beginning of semester
- **Assignments & Quizzes**
  - To be announced through canvas for each courses. No make-ups.

Virtual Lab/ Remote Lab

Virtual Lab/ Remote Lab

Formal Communication

- Formal BITS Notices will be delivered through Canvas Announcements and Emails in BITS ID.

- Configure your BITS email signature to carry the following details

  [Your Name as it appears on University Records]
  [Your Student ID - All Caps]
  M.Tech (DSE)[2021 October Batch]

- Include relevant details when you initiate a email communications with instructors / IC's / and others in BITS.
  - For Ex: your section #, when you write to your IC.

- Always use BITS Email ID for all official communication

Formal Communication

- Communicate with the appropriate ones for quick resolutions. For Ex:

  - Raise all queries on course contents, clarifications in the canvas discussion forums, messages to TA's, instructors or IC's

  - Other course related concerns as emails to your instructor / IC by email

  - Issues with canvas, matters related to access etc, issue with hall tickets, exam venues etc as tickets in student care help desk - Queries raised here will be typically resolved in 48 hours - You will find options to escalate your queries in the student care help desk in canvas.

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  M.Tech (DSE)[2021 October Batch]

- Include relevant details when you initiate a email communications with instructors / IC's / and others in BITS.
  - For Ex: your section #, when you write to your IC.

- Always use BITS Email ID for all official communication

Formal Communication

- Communicate with the appropriate ones for quick resolutions. For Ex:
  - Raise all queries on course contents, clarifications in the canvas discussion forums, messages to TA's, instructors or IC's

  - Other course related concerns as emails to your instructor / IC by email

  - Issues with canvas, matters related to access etc, issue with hall tickets, exam venues etc as tickets in student care help desk - Queries raised here will be typically resolved in 48 hours - You will find options to escalate your queries in the student care help desk in canvas.

Whom to Contact for support?

- Student Care Help Desk
- Coordinators Contact
  - pc.dse@wilp.bits-pilani.ac.in
- Operations Support
  - ops.dse@wilp.bits-pilani.ac.in

Questions ?

BITS Pilani

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