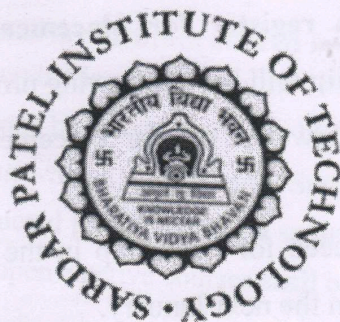


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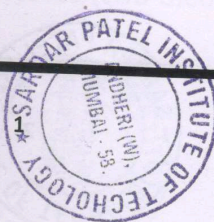
Revision: SPIT-4-19

Bachelor of Engineering/Technology (B.E./B.Tech)
in
Electronics and Telecommunication Engineering

Final Year Engineering
(Sem. VII and Sem. VIII)
Effective from Academic Year 2019 -20

Board of Studies Approval: 06/11/2018

Academic Council Approval: 16/01/2019



Principal

Sardar Patel Institute of Technology
Bhavans Andheri Campus



Sardar Patel Institute of Technology

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Choice Based Internship Policy Details

Category '1':

Students who want to **register for placement and interested in joining semester long internship** will have following procedure

1. They will follow the regular placement procedure during their 7th Semester
2. They will proceed for internship in the company in which they have been selected from the next January.
3. Their credit requirements of 8th semester will be completed at the end of the '**summer term**' of their semester 6th.
4. The semester long internship will have credits assigned to it with appropriate evaluation mechanism.
5. The detail credit structure for semester 8th of category '1' will be declared in their next term in Jan 2019.

Category '2':

Students who do not want semester long internship (i.e. would want to continue with their **higher education immediately** after their B.Tech./B.E. program).

1. The normal semester 7th and 8th will be working for them as per their regular academic calendar
2. The detail credit structure for semester 8 of category '2' will be declared in their next term in Jan 2019.
3. Students will be allowed to participate for the placement in normal company.



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Choice of Category '1' or '2' shall be taken from the students in the mid of SEM VI.

Category '1': Student chooses for institute offered internship:

In this case student attends 'Summer Term' of 6 weeks duration.

Internship should be done by the student from 15th January to 30th June.

All the courses shall run twice a week during 'Summer Term'. Thus 1 hour lecture should be conducted for 12 hours in a summer term to get 1 credit.

ESE for summer term open elective courses shall be conducted in first and second week of July.

Make-up Examination for open elective courses shall be conducted along with SEM VI Make-up Examination.

Category '2': Student opt out of 'Institute offered company internship'

Student attends normal regular semesters as per institute calendar

SEM VIII students will attend OE courses along with SEM VI students.

Student appears for regular ESE examination.

Make-up Examination shall be conducted in first and second week of July.

Internship Related Other Guidelines:

1. Once a particular 'Category' is selected by the student then he/she will **NOT be allowed to change the category** for whatsoever reason.
2. If performance of the student is reported as poor by the industry or industry raises concerns about attendance issues of student during the internship then student may be called back to the institute. In this case he/she will have to complete the coursework equivalent to internship credits. If institute runs 'summer term' then student can take courses (two theory courses and two labs)



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in summer term. Otherwise student will have to take courses (two theory courses and two labs) in the ODD semester of the next academic year. In this case student will be allowed to sit for the placement after rejoining the institute.

3. Internships will be given by the S.P.I.T. as per the selection criteria of company. Following are the other avenues for internships:

a. SPTBI

b. Reputed organizations like IIT, BARC, TIFR etc. with condition that the organization selected is ready to do the assessment for 10 credits of internship

c. If student get an internship offer on his own in a particular company then he/she needs to connect company.

4. For all internships, S.P.I.T. approval is must and there should be a grade penalty for students accepting internship and not joining a company or joining a company but not completing internship.

MOOC courses can be taken any time during the entire academic year. However MOOC* credits will be added to semester VIII as and when 'pass' certificate is submitted by the student.

List of MOOC courses will be curated by the department and students need to select from the list. If student wish to have course which is not present in the list then written approval from HoD and Dean Academics is necessary.



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Electronics and Telecommunication Engineering Department

Semester VII common to both category '1' and category '2'

SEM VII						
Course Code	Course Name	Group	Teaching Scheme (Hrs/week)			Credits
			L	T	P	Total
ET71	Mobile and Wireless Technologies	PC	3	--	--	3
ET72	Microwave and Optical Fiber Communication	PC	3	--	--	3
ETL71	Mobile and Wireless Technologies Lab	PC	--	--	2	1
ETL72	Microwave and Optical Fiber Communication Lab	PC	--	--	2	1
ETEL71	Elective-I Lab	PE	--	1	2	2
ETEL72	Elective-II Lab	PE	--	1	2	2
ETP71	Category-'1': Major Project-II Category-'2': Major Project-I	PR	--	--	10#	5
CEP5	Problem solving module-V (Optional)	CEP				
	Total		6	2	20	17

Student choose either A or B electives track

ETEL71A Machine Learning and Artificial Intelligence
ETEL71B Advanced Signal Processing
ETEL71C IP Network Design

ETEL72A Cryptography and Network Security
ETEL72B Multimedia Communication Systems

Summer Term for Category '1: Student chooses for semester long internship

Summer Term						
Course Code	Course Name	Group	Teaching Scheme (Hrs/week)			Credits
HSS81	Technology Entrepreneurship Lab	HSS	--	--	2	1
OE^	Open Elective @	OE	1@	--	2@	2@
OE^	Open Elective @	OE	1@	--	2@	2@
ETP81	Category-'1': Major Project-I	PR	--	--	10	5
MOOC	MOOC (Min 8 week course)	MOOC	--	--	--	2
INT	Internship	PR	--	--	--	10#
ABL5	Financial Planning, Taxation Policies and Investment (Noncredit)	--	--	--	--	--
	Total		2	--	12+4@	8+4@+10#



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Semester VIII for Category '2': Student opt out of 'Semester Long Internship'

SEM VIII						
Course Code	Course Name	Group	Teaching Scheme (Hrs/week)			Credits
HSS81	Technology Entrepreneurship Lab	HSS	--	--	2	1
OE^	Open Elective @	OE	1 @	--	2 @	2 @
OE^	Open Elective @	OE	1 @	--	2 @	2 @
ETP81	Category-'2': Major Project-II	PR	--	--	10	5
MOOC	MOOC (Min 8 week course)	MOOC	--	--	--	2
ABL5	Financial Planning, Taxation Policies and Investment (Noncredit)	--	--	--	--	--
ETE81^	A: Telecomm Network Operations & Management B: Wireless Network planning and Design	PE	3	1	--	4
ETE82^	A: Space Communication Technologies B: Cloud Computing and Analytics	PE	3	1	--	4
ETEL81^	A: Telecomm Network Operations & Management Lab B: Wireless Network planning and Design Lab	PE	--		2	1
ETEL82^	A: Space Communication Technologies Lab B: Cloud Computing and Analytics Lab	PE	--		2	1
Total			6+2@	2	16+4@	18+4@

List of Open Elective Courses:

OE1: Consumer Electronics (ETRX)

OE2: Robotic Vision (ETRX)

OE3: Cyber Security and Digital Forensics (EXTC)

OE4: Internet of Things (EXTC)

OE5: Fundamentals of Computational Intelligence (COMP)

OE6: Fundamentals of Data Structures and Algorithms (COMP)

OE7: Software Testing (IT)

OE8: Database Management Systems (IT)



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Evaluation Scheme

B.E. Electronics and Telecommunication Engineering (SEM VII)						
Course Code	Course Name		Marks			
			ISE	MSE	ESE	Total
ET71	Mobile and Wireless Technologies	PC	20	20	60	100
ET72	Microwave and Optical Fiber Communication	PC	20	20	60	100
ETL71	Mobile and Wireless Technologies Lab	PC	40	--	--	40
ETL72	Microwave and Optical Fiber Communication Lab	PC	40	--	--	40
ETEL71	Elective-I Lab	PE	40	--	20	60
ETEL72	Elective-II Lab	PE	40	--	20	60
ETP71	Category-'1': Major Project-II Category-'2': Major Project-I	PR	80	--	20	100
CEP5	Problem solving module-V (Optional)	CEP	--	--	--	--
Total						500
For Category '2': B.E. Electronics and Telecommunication Engineering (SEM VIII)						
Course Code	Course Name		Marks			
			ISE	MSE	ESE	Total
HSS81	Technology Entrepreneurship Lab		40	--	--	40
OE^	Open Elective @		40	10	20	70
OE^	Open Elective @		40	10	20	70
ETP81	Category-'2': Major Project-II		80 &	--	20	100
MOOC	MOOC (Min 8 week course)		--	--	--	100
ABL5	Financial Planning, Taxation Policies and Investment (Noncredit)		--	--	--	--
ETE81^	A:Telecom Network Management B: Wireless Network Planning and Design		20	20	60	100
ETE82^	A: Space Technologies B: Cloud Computing and Analysis		20	20	60	100
ETEL81^	A:Telecom Network Management Lab B: Wireless Network Planning and Design Lab		40	--	--	40
ETEL82^	A: Space Technologies Lab B: Cloud Computing and Analysis Lab		40	--	--	40
Total						660

& Phase-I: 40

Phase-II: 40

SUMMER TERM: For Category '1': B.E. Electronics and Telecommunication Engineering (SEM VIII)						
Course Code	Course Name		Marks			
			ISE	MSE	ESE	Total
HSS81	Technology Entrepreneurship Lab		40	--	--	40
OE^	Open Elective @		40	10	20	70
OE^	Open Elective @		40	10	20	70
ETP81	Category-'1': Major Project-I		80&	--	20	100
MOOC	MOOC (Min 8 week course)		--	--	--	100
ABL5	Financial Planning, Taxation Policies and Investment (Noncredit)		--	--	--	--
INT	Internship		--	--	--	*280
Total						660

* Kindly refer internship evaluation guidelines for 280 marks



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Monitoring & Evaluation of Internship

Course Name: Internship Course Code: INT	MSE	ESE	Total Marks	Total Credits
Institute Supervisor Evaluation	70	70	140	05
Industry Mentor Evaluation	70	70	140	05
	140	140	280	10

For MSE and ESE: 60 Marks Rubrics Based Evaluation

10 Marks Internship Report Evaluation

Parameters for Rubrics Based Evaluation of Intern

(Needs improvement=1; Satisfactory=2; Good=3; Excellent=4)

S.N.	Parameters	Scale (1 to 4)
1	Behaviors	
2	Performs in a dependable manner	
3	Cooperates with co-workers and supervisors	
4	Shows interest in work Learns quickly	
5	Shows initiative	
6	Accepts responsibility	
7	Accepts criticism	
8	Demonstrates organizational skills	
9	Shows good judgment	
10	Analyzes problems effectively	
11	Is self-reliant	
12	Communicates well	
13	Has a professional attitude and appearance	
14	Is punctual	
15	Uses time effectively	
Rate the following parameters for Internship Report (Needs improvement=1; Satisfactory=1.5; Good=2; Excellent=2.5)		
17	Writes effectively	
18	Uses technical knowledge and expertise	
19	Demonstrates creativity/originality	
20	Produces high quality work	
Total (Out of 70)		



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		3	--	--	3	--	--	3
ET71	Mobile and Wireless Technologies	Examination Scheme						
		ISE		MSE	ESE		Total	
		20		20	60		100	

Pre-requisite Course Codes		ET51, ET54
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Comprehend wireless communication concepts, system capacity and service provided.
	CO2	Evaluate various path loss and fading effects
	CO3	Analyze losses, multipath effects, architecture and protocols of 3G, 4G and 5G systems
	CO4	Compare various aspects of cellular and wireless systems such as path loss, fading, architecture and protocols

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Fundamentals of Mobile Communication		10
	1.1	Introduction to mobile communication		
	1.2	Frequency Division Multiple access, Time Division Multiple access, Spread Spectrum Multiple access, Space Division Multiple access, and OFDM.		
	1.3	Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, trunking and grade of service, improving the capacity of cellular systems and related design problems.		
2		Mobile Radio Propagation-Large scale path loss		8
	2.1	Introduction to radio wave propagation, reflection, diffraction, scattering		
	2.2	Indoor and Outdoor propagation Models.		
	2.3	Practical Link Budget Design using path loss models.		
3		Mobile Radio Propagation-Small Scale fading and Multipath		



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	3.1	Small-Scale Multipath propagation, Small scale multipath measurements, types of small-scale fading, fading effects due to Doppler spread.		8
	3.2	Rayleigh and Rician Distribution , Statistical models for multipath fading channels-Clarks model,2-ray Rayleigh fading model, Saleh and Valenzuela indoor model, SIRCIM and SMRCIM indoor and outdoor models		
	3.3	Modulation Parameters , Handoff and Power control.		
4		3G UMTS Network, 4G LTE and 5G Technologies		10
	4.1	UMTS network architecture, Protocol Structure, Channel Structure, Frame slots and symbols, modulation, coding, multiple antenna techniques.,WCDMA,Modulation, Handoff and Power Control		
	4.2	4G LTE network Architecture, LTE Radio Access,Radio-Interface Architecture,Physical Transmission Resources, Downlink and Uplink Physical-Layer Processing, Scheduling and Rate Adaptation..		
	4.3	5G Concepts and Architectures,Network Slicing Architecture, mmWave communication,multiple Cell Types		
	4.4	Smart Antennas and MIMO, Virtualization, VoLTE, RCS, WebRTC, and Wi-Fi Calling.		
5		Personal Area Network Technologies.		6
	5.1	Bluetooth: concepts of Piconet , scatternet etc., protocol stack, link types, security, network connection establishments, usage models, etc.		
	5.2	Wifi and ZigBee: components, architecture, network topologies, protocol stack etc.		
	5.3	UWB and RFID: technical requirements, components and characteristics, applications.		
Total				42



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Recommended Books:

- [1] Theodore S. Rappaport —Wireless Communications, Prentice Hall of India, PTR publication
- [2] Andreas Molisch—Wireless Communications, Wiley, Student second Edition.
- [3] Vijay Garg —Wireless Network Evolution 2G-3G, Pearson Education.
- [4] Young Kyun Kim and Ramjee Prasad—4 G Roadmap and Emerging Communication Technologies — Artech house.
- [5] Singhal—Wireless Communication, TMH
- [6] C.Y Lee —Mobile Communication, Wiley



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		3	--	--	3	--	--	3
ET72	Microwave and Optical Fiber Communication	Examination Scheme						
		ISE		MSE	ESE		Total	
		20		20	60		100	

Pre-requisite Course Codes		ET34
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Apply EM Wave theory and Ray theory to understand nature of Microwave and Optic Signal and their corresponding guiding structures
	CO2	Identify and Analyse System Components including Sources and Detectors
	CO3	Compare different Optical Networks
	CO4	Design tuning networks and optical Link Budget system

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Introduction to Microwave Engineering		10
	1.1	Lumped and Distributed Elements, Frequency Bands, Characteristics, Application, Advantages	1,2	
	1.2	Rectangular and circular waveguides: TE, TM modes, dominant mode	1,2,3	
	1.3	Microwave Components: Resonators, reentrant cavities, scattering parameters, tees, hybrid ring, directional couplers, phase shifters, terminations, attenuators, ferrite devices such as isolators, gyrators, and circulators.	1,2	
2		Microwave Tubes and Impedance Matching		8
	2.1	Two Cavity Klystron and Reflex Klystron, Helix Travelling Wave Tube, Cross Field Amplifier, Cylindrical Magnetron	2	
	2.2	Impedance Matching: Quarter Wave Transformer, Single stub and Double stub.	1,2,3	
3		Optical communication fundamentals		8
	3.1	Block diagram of Optical Communication system, advantages, loss and bandwidth window, ray theory transmission, total	4,5	



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		internal reflection, acceptance angle, numerical aperture, and skew rays		
	3.2	EM waves, modes in planar guide, phase and group velocities, types of fibers according to refractive index profile and mode transmission.	4,5	
	3.3	Couplers, Isolators, circulators, multiplexers, filters, fiber gratings, Fabry Perot filters, arrayed waveguide grating, switches and wavelength converters	4,5	
4		Optical communication Components		
	4.1	(LED, LASER), Detectors (PIN, APD) and Amplifiers	4,5	8
5		Losses in Optical fibers and Optical Networks		
	5.1	Attenuation, absorption, linear and nonlinear scattering losses, bending losses, modal dispersion, waveguide dispersion, dispersion and pulse broadening, dispersion shifted and dispersion flattened fibers, and non linear effects Measurements of attenuation, dispersion and OTDR	4,5	8
	5.2	Optical Networks: Link budget ,SONET, SDH, WDM,DWDM	6	
			Total	42

Recommended Books:

[1] David M Pozar, —Microwave Engineering, John Wiley & Sons,Inc. Hobokenh,New Jersey, Fourth Edition, 2012.

[2] Samuel YLiao, —Microwave Devices and Circuits|| , Pearson Education, Third Edition

[3] R.K. Shevgaonkar, Electromagnetic Waves, TATA McGraw Hill Companies, 3 rd Edition,2009.

[4] John M. Senior, — Optical Fiber Communication|| , Prentice Hall of India Publication, Chicago, 3rd Edition, 2013

[5] Gred Keiser, — Optical Fiber Communication|| , Mc-Graw Hill Publication , Singapore, 4th Edition, 2012

[6] 4. Rajiv Ramaswami and Kumar N. Sivarajan, — Optical Networks: A Practical Pererspective, Elsevier Publication Elsevier India Pvt.ltd, 3rd Edition, 2010

Weblinks: <http://nptel.ac.in/> by Prof R.K. Shevgaonkar, Department of Electrical Engineering Indian Institute of Technology, Bombay.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	--	2	--	--	1	1
ETL71	Mobile and Wireless Technologies Lab	Examination Scheme						
		ISE		MSE	ESE		Total	
		40		--	--		40	

Pre-requisite Course Codes		ET71, ETL62
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Comprehend hardware components of Mobile Communications Systems using AT Command and Python Scripting.
	CO2	Simulate and analyse Modulation Techniques using GNU Radio, Mobile Tx/Rx using USRP
	CO3	Understand the Protocol Architecture and Operation of LTE, 5G and WiFi using NS3 and Omnet++

Exp No.	Experiment Details	Ref.	Marks
1.	Study of GSM modem: i] Install and configure minicom, wvdial & AT Commands ii] Python scripting.		5
2.	Channel Allocation Techniques		5
3.	Modulation Techniques using GNU Radio.		5
4.	Spread Spectrum Modulation, OFDM Modulation.		5
5.	Wireless Path Loss Computations: i] Free-space Propagation Path Loss Model ii] Outdoor Propagation Model - Okumura Model iii] Outdoor Propagation Model - Hata Model		5
6.	Open Source LTE/EPC Network Simulation using NS-3, Omnet++		5
7.	Virtual Lab.		5
8.	Milimeter Wave (5G) Network, WiFi Network simulation using NS-3, Omnet++		5
	Total		40



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	--	2	--	--	1	1
ETL72	Microwave and Optical Fiber Communication Lab	Examination Scheme						
		ISE		MSE	ESE		Total	
		40		--	--		40	

Pre-requisite Course Codes		ET32, ET34
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Distinguish, Characterise and measure the basic parameters of Microwave Communication using Microwave Measurement Setups and Techniques.
	CO2	Use Modern Tools to design and analyse Microwave Components
	CO3	Analyse different parameters of optical fiber, optical sources and detectors
	CO4	Use Modern Tools to design and analyse Optical Network

Exp No.	Experiment Details	Ref.	Marks
1.	Microwave bench setup (CO1) A) Introduction to the lab B) Identification of waveguide and its components. How to determine the parameters for each component by looking at the data sheet. C) Klystron setup and characterization plotting V_r vs V_o D) Frequency and wavelength measurement of the signal generated by klystron.		5
2.	Determination of parameters of passive components using Bench and VNA. Analysis of comparative study to be submitted. (CO1)		5
3.	Simulation Microwave Experimentation using HFSS (CO2) A) Introduction to HFSS B) Design of Rectangular Waveguide WR-159. Validation of design using datasheets. C) Task Design of Rectangular Waveguide WR-90. Along with Brief description of changes made and comparative study .		5
4.	Design of Passive component : H-plane Tee using HFSS (CO2)		5
5.	Determine Numerical aperture of the fiber (CO3)		5
6.	a. Study of Supercontinuum generation and soliton propagation in Python b. Dispersion calculation in Python (CO 3,4)		5
7.	Determine the characteristics of LED and Photodetector (CO3)		5
8.	Design optical network in python (CO4)		5
	Total		40



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	1	--	--	1	--	1
ETEL 71A	Machine Learning & AI	Examination Scheme						
		ISE		MSE	ESE		Total	
		--		--	--		--	

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	To describe the basic concepts and techniques of Machine Learning.
	CO2	To apply knowledge representation, reasoning, and machine learning techniques to real-world problems
	CO3	To use recent machine learning software for solving practical problems.
	CO4	To know various AI algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms)

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Introduction : What is Machine Learning: Notation of Dataset , Training Set and Test Set, No Free Lunch Rule, Relationships with Other Disciplines	1,2	1
2		Basic Concepts and Ideals of Machine Learning: Designing versus Learning, The Categorization of Machine learning, The Structure of Learning, What are we Seeking? The Optimization Criterion of Supervised Learning, The Strategies of Supervised Learning	1,2	2
3		Principles and Effects of Machine Learning: The VC bound and Generalization Error, Three Learning Effects, Feature Transform, Model Selection, Three Learning Principles, Practical Usage: The First Glance	1,2	2
4		Techniques of Supervised Learning: Supervised Learning Overview, Linear Model (Numerical Functions), Perceptron Learning Algorithm (PLA) – Classification, From Linear to Nonlinear, Adaptive Perceptron Learning Algorithm (PLA) – Classification, Linear Regression – Regression, Rigid	1,2	3



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		Regression – Regression, Support Vector Machine (SVM) and Regression (SVR, Extension to Multi-class Problems, Conclusion and Summary		
5		Techniques of Unsupervised Learning	1,2	3
6		Practical Usage: Pattern Recognition, examples	,2	1
			Total	12

References:

- [1] Tom M. Mitchell. "Machine Learning" McGraw-Hill, 1997.
- [2] P. Langley. "Elements of Machine Learning" Morgan Kaufmann Publishers, Inc. 1996.
- [3] Ethem Alpaydin "Introduction to machine learning" 2nd ed. The MIT Press, 2010
- [4] S. Sivanandam, "Principles of Soft Computing" First Edition Wiley Publications.
- [5] Andreas C. Muller and Sarah Guido. "Introduction to Machine Learning with Python" Oreilly Publication.
- [6] Luger George F, Artificial Intelligence : Structures and Strategies for Complex Problem Solving, 6 th Edition, Addison-Wesley,2009.
- [7] Stuart Russell and Peter Norvig, "Artificial Intelligence. A Modern Approach", 3rd edition, Prentice Hall, Inc., 2010



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	--	2	--	--	1	1
ETEL 71A	Machine Learning and AI Lab	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Make use of data sets in implementing the machine learning algorithms
	CO2	Build linear model and evaluate performance analysis of model
	CO3	Evaluate Supervised and Unsupervised Machine Learning Algorithms
	CO4	Implement the machine learning concepts and algorithms in any suitable language of choice.

Exp No.	Experiment Details	Ref.	Marks
1.	Show how FIND-S algorithm used for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a CSV file.	1,2	5
2.	Implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training example that are given as per .CSV file	1,2	5
3.	Write Python program to demonstrate the working of the decision tree based ID3 algorithm by using appropriate data set for building the decision tree and apply this knowledge to classify a new sample	1,2	5
4.	Build an Artificial Neural Network (ANN) by implementing the Back-propagation algorithm and test the same using appropriate data sets.	1,2	5
5.	Implement python program showing naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	1,2	5
6.	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in	1,2	5



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	Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.		
7.	Implement the naïve Bayesian Classifier model to classify set of documents that you have assumed Calculate the accuracy, precision, and recall for your data set.	1,2	5
8.	Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm . Compare the results of these two algorithms and comment on the quality of clustering. You can make use of /Python ML library classes/API in the program.	1,2	5
9 (Optiona l/Extra)	Write python program to implement k-Nearest Neighbour algorithm to classify the iris data set by using suitable ML libraty.. Print both correct and wrong predictions.	1,2	
10 Optional /Extra)	Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points while selecting appropriate data set for your experiment and draw graphs.	,2	
	Total		40

References:

- [1] Tom M. Mitchell. "Machine Learning" McGraw-Hill, 1997.
- [2] P. Langley. "Elements of Machine Learning" Morgan Kaufmann Publishers, Inc. 1996.
- [3] Ethem Alpaydin "Introduction to machine learning" 2nd ed. The MIT Press, 2010
- [4] S. Sivanandam, "Principles of Soft Computing" First Edition Wiley Publications.
- [5] Andreas C. Muller and Sarah Guido. "Introduction to Machine Learning with Python" Oreilly Publication.
- [6] Luger George F, Artificial Intelligence : Structures and Strategies for Complex Problem Solving, 6 th Edition, Addison-Wesley,2009.
- [7] Stuard Russell and Peter Norvig, "Artificial Intelligence. A Modern Approach", 3rd edition, Prentice Hall, Inc., 2010



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	1	2	--	1	1	2
ETEL71B	Advanced Signal Processing Lab	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Pre-requisite Course Codes		Signals & Systems, DTSP
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Analyze one dimensional and multidimensional signals in different domain .
	CO2	Able to estimate energy and power spectral density using non parametric method of spectral estimation.
	CO3	Apply Image processing tools for video analysis and applications
	CO4	Apply signal processing technique for analysis of biomedical signals
	CO5	Able to apply signal processing techniques for speech recognition and speech synthesis.

Exp No.	Experiment Details	Ref.	Marks
1.	Analyse different signals in time and frequency domains	1,2	5
2	To find output of FIR filter for long input/real time signal using FFT	5	5
3	Analysis of image signals in frequency domains using DFT, DWT and different wavelet transforms	1,2	5
4	Image enhancement in frequency and time domain	1	5
5	Estimate the energy and power spectral density using non parametric method of spectral estimation	5	5
6	Analysis of biomedical signal like ECG and EEG in time and frequency domain	3	5
7	Estimate speech signal parameters for speech signal analysis and synthesis using MFCC and DTW	4	5



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8	Design and apply Kalman filter for Detection & Tracking of object in video sequence	5	5
	Total		40

Recommended Books:

1. Gonzalez Woods- Digital Image Processing ,Pearson Education, Second Edition
2. Raghuveer. M. Rao and Ajit S.Bopardikar- Wavelet Transforms -Introduction to theory and applications, Pearson Education, Asia, 2000
3. Rangaraj M. Rangayyan-Biomedical Signal Analysis- A Case Study Approach, Wiley 2002.
4. Rabiner and Schafer, — Digital Processing of Speech Signals|| , Pearson Education, Delhi, 2004.Eval Scheme:
5. Monson Hayes- Statistical Digital Signal processing and Modelling, Wiley publication



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	1	2	--	1	1	2
ETEL71C	IP Network Design Lab	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Pre-requisite Course Codes		ET62 and ETL62
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Set up a network and configure switches and routers with troubleshooting
	CO2	Design LAN with implementation of subnets
	CO3	Design LAN-WAN interface for internetworking
	CO4	Implement VOIP, IPv6 and ETA

Exp No.	Experiment Details	Ref.	Marks
1.	Network Setup: Hardware and Software Components and Troubleshooting	1,2	5
2.	Installation and usage of CISCO tool -- Packet Tracer	3	5
3.	LAN Design - Part I Selection and configuration of switch IP Planning Static Troubleshooting	1,2,3	5
4.	LAN Design - Part II Subnet Design IP Planning Dynamic DHCP Troubleshooting	3	5
5.	LAN - WAN Design Selection and configuration of router Interface Design Troubleshooting	4,5	5
6.	VOIP Configuration Troubleshooting	4,5	5
7.	IPv6 Implementation	3,4,5	5
8.	Encrypted Traffic Analyzer (ETA)	6	5
	Total		40



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Recommended Books:

- [1] Data Communication and Networking by Behrouz A. Forouzan ,5th Edition, Mcgraw Hill Publication
- [2] Data Communication and Networking by Behrouz A. Forouzan ,8th Edition, Pearson
- [3] CCNA Routing and Switching Complete Study Guide: Exam 100-105, Exam 200-105, Exam 200-125 2nd Edition, Kindle Edition by Todd Lammle (Author)
- [4] CCNP Routing and Switching Switch 300 - 115 Official Cert Guide (With Dvd) by David Hucaby, Pearson Publication
- [5] CCIE: Cisco Certified Internetwork Expert Study Guide Book by John Swartz and Todd Lammle
- [6] <https://www.cisco.com/c/en/us/solutions/enterprise-networks/enterprise-network-security/eta.html#~stickynav=1> accessed on 8th october 2018.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	1	2	--	1	1	2
ETEL72A	Cryptography and Network Security Lab	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Pre-requisite Course Codes		CCN, OS
After successful completion of the course, student will be able to		
Course Outcomes	CO1	List and describe types of Cryptography and Cryptanalysis
	CO2	Demonstrate the symmetric and asymmetric cryptography, cryptographic hash functions, digital signature, digital certificate and certificate authority (CA), CA structure.
	CO3	Build and implement cryptosystems using python
	CO4	Install and configure and optimize the firewall, IDS, Authentication system

Exp No.	Experiment Details	Ref.	Marks
1.	Cryptool kit	1	5
2.	gpg: Open Source Implementation of PGP (GNU's Privacy Guard) and PKI using OpenSSL	1,2,3	5
3.	Cryptography Coding using Pycrypto	4	5
4.	Network socket programming: Network Scanning and Vulnerability Scripting (NASL)	5,8	5
5.	Enterprise Network Firewall Administration: DPF and L7 content filtering and pfSense	6,8	5
6.	<u>A</u> nalysis <u>C</u> onsole for <u>I</u> ntrusion <u>D</u> atabases (ACID) and Snort IDS	7,8	5
7.	System hacking using metasploit framework(MSF)	9	5
8.	Wireless Network Security Assessment	8	5
	Total		40



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Recommended Books:

[1] <https://www.cryptool.org/en/cryptool1>

[2] <https://www.openssl.org/>

[3] <https://gnupg.org/>

[4] <https://pypi.org/project/pycrypto/>

[5] Nmap: Network Exploration and Security Auditing Cookbook - Second Edition

Book by Paulino Calderon Packt Publications



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	1	2	--	1	1	2
ETEL72B	Multimedia Communication Systems Lab	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		20		60

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Use multimedia software and hardware tools and also they can interact with multimedia practically.
	CO2	Demonstrate audio & video codec.
	CO3	Create games/animations by using multimedia concepts.
	CO4	Compress audio & video using multimedia software tools.

Exp No.	Experiment Details	Ref.	Marks
1.	Issues in multimedia (Authoring and Design)	1	5
2.	To Study Audio Codec & Audio compression Techniques	2	5
3.	To study Video Compression Techniques .	2	5
4.	Write a program by which we can split mpeg video into smaller pieces for the purpose of sending it over the web or by small capacity pen drives and then joining them at the destination.	3	5
5.	To design game/animation.	3	5
6.	To design a movie on given topic by using photos, videos, background music with audio files with effects using Movie Maker.		5
7.	Streaming server client	3,4	5
8.	Multimedia communication and retrieval (Mini Project Task)		5
	Total		40

Recommended Books:

- [1] Fundamentals of Multimedia by Ze-Nian Li & Mark S. Drew. 2004.
- [2] An introduction to digital multimedia by Savage, T. M. and Vogel, K. E. 2008.
- [3] Digital Multimedia by Nigel Chapman & Jenny Chapman. 2009.
- [4] References: <https://ffmpeg.org/> and <http://opencv.org/>
- [5] VoIP and Unified Communications: Internet Telephony and the Future: William Flanagan



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		3	1	--	3	1	--	4
ETE81A	Telecom Network Operations & Management	Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Pre-requisite Course Codes		CCN, OS
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Explain the need for interoperable network management & analyze the trends and development of the Telecommunications Network Management.
	CO2	Identifying the functions of the Network Manager and analyzing the Infrastructure of Network Management
	CO3	Implement server/agent architectures to monitor and control networks, devices,resources and applications
	CO4	Analyse and apply basic of telecommunication, networking and information technologies and architect and implement networked informative systems.

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Introducing Network Design Concepts: Network designers ensure that our communications networks can adjust and scale to the demands for new services.To support our network-based economy, designers must work to create networks that are available nearly 100 percent of the time. Challenges of IT managers,Network management architecture and organization network management perspectives management: Goals, organization and functions	1,2	10
2		OSI Network Management: Network management standards, Network management models,Organization model, Information model Communication model and functional model, Abstract syntax notation – encoding structure, macros	1,2, 3	6



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		functional model CMIP/CMISE		
3		Internet Management (SNMP): SNMP-organizational model-System overview.Information model, communication model, functional model, SNMP proxy server, Management information, Protocol SNMPv1,v2 and V3, Remote monitoring. RMON, Limitations of SNMP, Beyond SNMP, NETCONF/YANG	1,2, 3	10
4		Telecommunication Management Networks(TMN) : Need for TMN , Conceptual TNM model, TMN Network Management Architecture, TMN management services architecture and TMN implementation	1,2, 3	6
5		Network Management Tools and Applications : System Utilities for network management, Network statistics and measurements, NMS Design, NMS components, NMS Server Architecture, Network Management Systems and FCAPS, Automatic Fault Management and Event correlation Techniques, Security Management	1,4, 5	10
Total				42

References:

- [1] Mani Subramaniam, —*Network Management Principles and Practise*”, Addison Wisely, New York, 2000.
- [2] Designing and Supporting Computer Networks, CCNA Discovery Learning Guide By Kenneth Stewart, Aubrey Adams, Allan Reid, Jim Lorenz, Cisco Press
- [3] Network Management: Concepts and Practice, A Hands-On Approach by J. Richard Burke, Pearson Publications.
- [4] Network Management: Accounting and Performance Strategies by Benoit Claise - CCIE No. 2686; Ralf Wolter CISCO Press
- [5] Network Management Fundamentals, Alexander Clemm, Cisco Press, December 2006, ISBN-13: 978-158720137
- [6] Python for Software Design by Allen B. Downey, Cambridge University Press, March 2009, ISBN-13: 978-0521725965. A free manuscript is available at the author's website.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	--	2	--	--	1	1
ETEL81A	Telecom Network Operations & Management	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		--		40

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Troubleshoot and monitor network using various commands, tools and utilities
	CO2	Install and configure host/network/server/services management using open source tools.
	CO3	Configuration of switch for network management functions
	CO4	Build and implement Security Information Enterprise Management (SIEM) project using Opens Source Software (OSS)

Exp No.	Experiment Details	Ref.	Marks
1.	1. Network Monitoring tools a) Status b)Route c)Traffic Tools d)Audit	1,2	5
2.	Monitoring and management network using SNMP a) Basic SNMP b) Advanced SNMP v3 Authentication/Encryption and ACL c) SNMP Trap Daemon Implementation	1,2	5
3.	Configuration SNMP Protocol on Cisco Router using Packet Tracer	9	5
4.	Configuration manageable Switch: Dlink DES 3026 24 Port L2 Switch	3	5



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5.	LAN Troubleshooting using tcpdump and Wireshark	4,5	5
6.	Monitoring of services and Servers using a) Observium/ Cacti b) Nagios/Icinga	6	5
7.	Implementation of Centralized Logging infrastructure and security event correlation	1,7	5
8.	Open Source SIEM Project	5	5
	Total		40

Recommended Books:

[1] Network Management Principles and Practise 2/e by Mani Subramaniam, Addison Wisely, New York, 2000.

[2] Network Management: Concepts and Practice, A Hands-On Approach by J. Richard Burke, Pearson Publications.

[3] D-Link Switch Manual DES 3026

[4] Wireshark 101: Essential Skills for Network Analysis by Laura Chappel, Wireshark Series Solutions

[5] Practical Packet Analysis, 3E: Using Wireshark to Solve Real-World Network Problems 3rd Edition by Chris Sanders, No starch press, San Francisco

[6] <https://www.cio.com.au/article/557312/7-free-tools-every-network-needs/> Accessed on 7th October 2018

[7] Network Security Through Data Analysis Building Situational Awareness by Michael Collins, Oreilly Publications

[8] <https://www.prelude-siem.org/projects> accessed on 8th October 2018.

[9] <https://www.netacad.com/courses/packet-tracer> accessed on 8th October 2018.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		3	1	--	3	1	--	4
ETE81B	Wireless Network Planning and Design	Examination Scheme						
		ISE		MSE	ESE		Total	
		20		20	60		100	

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Understand RF planning basics and DAS .
	CO2	Design indoor DAS planning solutions and Tunnel Radio Planning
	CO3	Analyze performance of the various indoor planning aspects
	CO4	Evaluate the various aspects of wireless network planning

Module No.	Unit No.	Topics	Ref.	Hrs.
1		Indoor Radio Planning	1,2	7
	1.1	Indoor Coverage from the Macro Layer, The Indoor 3G/HSPA Challenge.		
	1.2	The Basics of Indoor RF Planning, RF Metrics Basics		
2		Distributed Antenna System	1,2	8
	2.1	Passive Components, The Passive DAS, Active DAS		
	2.2	Hybrid Active DAS solution, Indoor DAS for MIMO Application		
	2.3	Using repeaters for Indoor DAS coverage, Active DAS data.		
3		Designing Indoor DAS Solution	1,3	8
	3.1	Indoor Planning procedure, RF design process, Designing Optimum Indoor solution.		
	3.2	Indoor Design Strategy, Handover considerations, Elevator coverage		
	3.3	Multioperator Systems, Co-existence issues for 2G/3G, Multi-operator requirements.		
4		Traffic Dimensioning and Noise	1,4	9
	4.1	Erlang the traffic measurement, 2G, 3G channel and Erlang.		
	4.2	Trunking Gain, Resource sharing, cell configuration in Indoor projects		
	4.3	Noise fundamentals, cascaded noise, noise power, noise control.		



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5		Tunnel Radio Planning and Link Budget	1	10
	5.1	Tunnel HO zone, Tunnel Solutions cascaded BDSa and T-Systems, Handover design inside tunnel, RF test specifications of tunnel projects.		
	5.2	Covering Indoor users from the outdoor network, Micro cell capacity, Digital distribution of DAS, High speed rail solutions.		
	5.3	Componets and calculation of RF Link, 4G Link Budget		
			Total	42

Recommended Books:

- [1] Indoor Radio Planning A Practical Guide for 2G, 3G and 4G- Morten Tolstrup- Wiley Publication.
- [2] Theodore S. Rappaport , —Wireless Communications , Prentice Hall of India, PTR publication
- [3] Andreas Molisch , —Wireless Communications , Wiley, Student second Edition.
- [4] Vijay Garg , —Wireless Network Evolution 2G-3G , Pearson Education.
- [5] Young Kyun Kim and Ramjee Prasad, —4 G Roadmap and Emerging Communication Technologies —, Artech house.
- [6] C.Y Lee , —Mobile Communication , Wiley



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	--	2	--	--	1	1
ETEL81B	Wireless Network Planning and Design Lab	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		--		60

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Simulate various wireless network planning parameters
	CO2	Debug programs
	CO3	Analyze results of simulation
	CO4	Document Cellular and Wifi signal strength behaviour in detail

Exp No.	Experiment Details	Ref.	Marks
1.	Preparing a Survey Report on Cellular signal strength on Each floor of building. And Identify Coverage Holes.		5
2.	Preparing a Suvey Report on WiFi signal strength on Each floor of building. And Identify Coverage Holes.		5
3.	Coverage Simulation Using PyLayers software		5
4.	Ray Tracing Simulation Using PyLayers software		5
5.	Handling Agent Mobility Using PyLayers Software.		5
6.	Path Gain Simulation Using PyLayers Software.		5
7.	To study High Speed Railway Communication Solutions.		5
8.	To study Tunnel HO and RF test specifications for Tunnel Projects.		5
	Total		40



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		3	1	--	3	1	--	4
ETE 82A	Space Communication Technologies	Examination Scheme						
		ISE		MSE	ESE		Total	
		20		20	60		100	

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	To understand the basics of satellites and orbits.
	CO2	To understand the satellite segment and earth segment.
	CO3	To analyze the various methods of satellite access.
	CO4	To understand the applications of satellites.

Module No.	Unit No.	Topics	Ref.	Hrs.
1		SATELLITE ORBITS	1,2	7
	1.1	Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits		
	1.2	Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures – launch vehicles and propulsion.		
2		SPACE SEGMENT AND SATELLITE LINK DESIGN	1,2	8
	2.1	Spacecraft Technology- Structure, Primary power, Attitude and Orbit control,.		
	2.2	Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command		
	2.3	Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference		
	2.4	Propagation Characteristics and Frequency considerations-		



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		System reliability and design lifetime.		
3		EARTH SEGMENT	1,3	8
	3.1	Introduction – Receive – Only home TV systems – Outdoor unit – Indoor unit for analog (FM) TV – Master antenna TV system – Community antenna TV system – Transmit – Receive earth stations – Problems –		
	3.2	Equivalent isotropic radiated power – Transmission losses – Free-space transmission – Feeder losses – Antenna misalignment losses – Fixed atmospheric and ionospheric losses – Link power budget equation –		
	3.3	System noise – Antenna noise – Amplifier noise temperature – Amplifiers in cascade – Noise factor – Noise temperature of absorptive networks – Overall system noise temperature – Carrier-to- Noise ratio –		
	3.4	Uplink – Saturation flux density – Input back off – The earth station – HPA – Downlink – Output back off – Satellite TWTA output – Effects of rain – Uplink rain– Fade margin – Downlink rain – Fade margin – Combined uplink and downlink C/N ratio – Inter modulation noise		
4		SATELLITE ACCESS	1,4	9
	4.1	Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system,		
	4.2	Digital video Broadcast, multiple access: FDMA, TDMA, CDMA,		
	4.3	Assignment Methods, Spread Spectrum communication, compression – encryption.		
5		SATELLITE APPLICATIONS	1	10
	5.1	INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS (United States (GPS) Japan (QZSS) Russia (GLONASS) China Peoples Republic of China (BeiDou Navigation Satellite System) European Union (Galileo) India (IRNSS), INMARSAT, LEO, MEO		
	5.2	Satellite Navigational System, Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH)		
	5.3	Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.		
Total				42



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Recommended Books:

- 1] Dennis Roddy, Satellite Communication, McGraw Hill, 4th edition, 2006.
- 2] Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.
- 3] N. Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
- 4] Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Boston London, 1997.
- 5] Tri T. Ha, "Digital Satellite Communication", II nd edition, 1990.
- 6] Emanuel Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		--	--	2	--	--	1	1
ETEL82A	Space Communication Laboratory	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		--		40

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Establish satellite link for communication for various data types.
	CO2	Analyze Different Orbital Parameters & link budget of satellite signal for proper communication for given data.
	CO3	Analyze the use of GPS system for the benefit of society
	CO4	Study & document different application of satellite communication

Exp No.	Experiment Details	Ref.	Marks
1.	i)To establish a direct communication link between Uplink Transmitter and Down Receiver using tone signal,Voice Signal.	1,2	5
2.	To transmit & receive function generator waveform & PC data through satellite link.	1,2	5
3.	To determine look angle (azimuth and elevation) of satellite implement code using Python or C .	1,2,4	5
4.	To find the orbital parameters of Satellite write a program using programming language(Python ,C).	1,2,4	5
5.	To study Link Budget uplink and downlink for satellite Communication given problem write a program using any programming language(Python ,C).		5
6.	To study GPS module and find the current location using latitude and longitude	1,2	5
7.	To design an Earth Station using programming language(Python ,C)	1,4	5
8.	To design an Earth Station using programming language(Python ,C)/Create a Model for (BPSK/QPSK)modulator and demodulation using any programming language.	1,4	5
	Total		40



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Recommended Books:

- 1] Dennis Roddy, Satellite Communication, McGraw Hill, 4th edition, 2006.
- 2] Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.
- 3] N. Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
- 4] Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Boston London, 1997.
- 5] Tri T. Ha, "Digital Satellite Communication", IInd edition, 1990.
- 6] Emanuel P. Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
		3	1	--	3	1	--	4
ETE82B	Cloud Computing and Analytics	Examination Scheme						
		ISE		MSE		ESE		Total
		20		20		60		100

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Define and explain cloud computing services and models.
	CO2	Compare and select cloud service providers/software.
	CO3	Implement open source cloud and administration.
	CO4	Describe the risks associated in cloud computing environment.

Module No.	Unit No.	Topics	Ref.	Hrs .
1		Introduction to Cloud Computing		10
	1.1	What's Cloud Computing, NIST Definition, properties and Service Model, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others		
	1.2	Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS.		
	1.3	Cloud computing platforms: Infrastructure as service: Amazon EC2, Platform as Service: Google App Engine, Microsoft Azure, Utility Computing, Elastic Computing.		
2		Cloud Technologies		08



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	2.1	Web services, AJAX and mashups: Web services: SOAP and REST, SOAP versus REST, AJAX: asynchronous 'rich' interfaces		
	2.2	Mashups: user interface services Virtualization Technology: Virtual machine technology, virtualization applications in enterprises, Pitfalls of virtualization.		
	2.3	Multitenant software: Multi-entity support, Multi-schema approach, Multitenance using cloud data stores, Data access control for enterprise application.		
3		Issues in cloud Computing		06
	3.1	Implementing real time application over cloud platform, Issues in intercloud environments, QoS Issues in cloud, Dependability, data Migration, streaming in cloud, QoS monitoring in cloud computing environment.		
	3.2	Cloud Middleware, A grid of clouds, Load Balancing in cloud		
	3.3	Resource optimization, resource dynamic reconfiguration		
4		Security architecture and Challenges		08
	4.1	Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures		
	4.2	Identity Management and Access control-Identity management, Access control, Autonomic Security.		
	4.3	Virtualization security management- virtual threats, VM Security Recommendations, VM-Specific Security techniques, Secure Execution Environments and Communications in cloud.		
5		Programming support of Google App Engine and Amazons		10



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		AWS		
	5.1	Programming the Google App Engine, Google file system(GFS), Bigtable Google NOSQL system		
	5.2	Programming on Amazon EC2, Amazon simple storage service(S3), Amazon Elastic block store(EBS), and SimpleDB.		
	5.3	Data Analytics and Cloud Computing: Big data concept, Hadoop and Apache spark stream engine.		
Total				42

Recommended Books:

- [1] Distributed and Cloud Computing From parallel processing to the internet of things, Kai Hwang, Geoffrey C. Fox, Jack J. Dongarra, ISBN : 9780123858801, ELSEVIER MK publishers, 2011.
- [2] Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper, Wiley India Edition.
- [3] Cloud Security & Privacy by Tim Maher, S.Kumaraswamy, S.Latif, SPD, O'REILLY.
- [4] Cloud Computing: A Practical Approach by J.Vette, Toby J. Vette, Robert Elsenpeter, Tata McGraw Hill.
- [5] Google Apps", by Scott Granneman, Pearson.

Course	Course Name	Teaching Scheme	Credits Assigned
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Code		(Hrs/week)						
		L	T	P	L	T	P	Total
		--	--	2	--	--	1	1
ETEL82B	Cloud Computing and Analytics Lab	Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		--		40

Pre-requisite Course Codes		
After successful completion of the course, student will be able to		
Course Outcomes	CO1	Implement and describe fundamentals of cloud computing and Summarize various cloud delivery models.
	CO2	Create and run virtual machines on open source OS.
	CO3	Implement Infrastructure, Storage as a Service.
	CO4	Install and explain security features for cloud.

Exp No.	Experiment Details	Ref.	Marks
1.	Study and implementation of Infrastructure as a Service.		5
2.	Implementation of identity management.		5
3.	Study and installation of Storage as Service.		5
4.	User Management in Cloud.		5
5.	Study and implementation of Single-Sign-On		5
6.	Write a program for web feed		5
7.	AWS Cloud		5
8.	Kubernetes		5
	Total		40

Recommended Books:

[1] Enterprise Cloud Computing by Gautam Shroff, Cambridge,2010.



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[2] Cloud Security by Ronald Krutz and Russell Dean Vines,”, Wiley - India, 2010,ISBN:978-0-470-58987-8.

[3] Getting Started with OwnCloud by Aditya Patawar, Packt Publishing Ltd, 2013.

[4] www.openstack.org

[5] <https://www.rss.com/>



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
HSS81	Technology Entrepreneurship Lab	--	--	2	--	--	1	1
		Examination Scheme						
		ISE		MSE		ESE		Total
		40		--		--		40

Pre-requisite Course Codes		
After successful completion of the course, student will be able to,		
Course Outcomes	CO1	Identify problems worth solving
	CO2	Craft value proposition
	CO3	Prepare B-Plan
	CO4	Draft Patent
	CO5	Register virtual company

Expt. No.	Topics	Ref.	Marks
1	Opportunity Discovery 1.1 Self-discovery 1.2 Effectuation Principle 1.3 Identification of problem worth solving 1.4 Looking for solutions 1.5 Present the problem Assignment Submission : Effectuation case study	1	8
2	Value Proposition Canvas and Business Model 2.1 Craft your value proposition 2.2 Presentation of Value Proposition Canvas 2.3 Business Model and Lean Approach (Finance, Marketing, Operations) 2.4 Presentation of Lean Canvas Assignment Submission : Presentation of Value Proposition Canvas	2,3	8
3	Business Plan (4 hours) 3.1 Creation of Business Plan Assignment Submission : Presentation of Lean Canvas	4	8
4	Intellectual Property Rights 4.1 Trademark 4.2 Copyright	5	8



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	4.3 Design 4.4 Patent Assignment Submission : Patent Draft and registration form for Trademark, Copyright, Design and Patent		
5	Company Formation 5.1 Promoters, Capital, Shareholders 5.2 Directors, DIN 5.3 Company Name, Registrations 5.4 Branding Assignment Submission : Virtual Company registration	6	8
	Five Assignments Marks		40

References :

- [1] "Elements of Entrepreneurial Expertise (New Horizons in Entrepreneurship Series)" by SarasSarasvathym, Publisher : Edward Elgar Publishing.
- [2] "Business Model Generation :A Handbook for Visionaries, Game Changers, and Challengers" by Alexander Osterwalder
- [3] "Value Proposition Design: How to create Products and Services Customers Want" by Alex Osterwalder, Yves Pigneur, Greg Bernarda, Alan Smith, Trish Papadacos
- [4] "Writing Winning Business Plans" by Garrett Sutton. Publisher: RDA Press
- [5] "Patent Law" by P. Narayanan. Publisher :Eastern Law House, 1975.
- [6] "Company Law Procedures" by M.C. Bhandari, LexiNexis, 2018



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ABL 5: Financial Planning, Taxation Policies and Investment

Financial Planning: It is possible to manage income more effectively through financial planning. Managing income helps to understand how much money is required for tax payments, other expenditures and savings. It increases cash flows by carefully monitoring the spending patterns and expenses. Knowledge of comprehensive financial planning will help students to make right financial decisions in their life. It gives guidance in helping choose the right types of investments to fit needs, personality, and goals of their life. In this activity students need to prepare the financial plan for their life.

Taxation Policies: Taxes are levied in almost every country of the world, primarily to raise revenue for government expenditures, although they serve other purposes as well. The simple fact in economics is that there are certain common public goods and public needs that require some form of government and regulation to provide or promote. Taxation is the way to pay for these common goods. In this activity student will learn various types of taxes like Income tax, Corporate tax, Capital gains, Property tax, Inheritance and Sales tax.

Investments: Investments are important because in today's world, just earning money is not enough. But that may not be adequate to lead a comfortable lifestyle or fulfil our dreams and goals. Money lying idle in the bank account is an opportunity lost. Therefore students should have a knowledge to invest money smartly to get good returns out of it. This activity will give insight to the students about investment in the form of Stocks, Mutual Funds, Fixed Deposits, Recurring Deposit, Public Provident Fund, **Employee Provident Fund and National Saving Schemes.**

Methodology: Guest lectures by professionals shall be arranged on Financial Planning, Taxation Policies and Investments. At least one session on each topic shall be taken. Assessment shall be based on performance in following activities:

1. Prepare financial plan
2. Filling of 'Income Tax Return' (Perquisite: Pan Card (if not available, student should apply for pan card))
4. Prepare investment plan



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETP81	Major Project I (Category I)	--	--	10	--	--	5	5
		Examination Scheme						
		ISE		MSE	ESE		Total	
		Phase-I:40 Phase-II:40		--	20		100	

The final year students have already undergone first stage of Major Project I OR Major Project II work in their respective semesters and in this semester students are expected to continue the project work of stage I they need to separately carry literature survey, define problem, title of the project and objectives of project.

The project work will be internally evaluated in Phases (Phase III and Phase IV) by the Expert Groups in the Department consisting of Guide and two OR more than two domain expert faculties based on Scheme of examination for ISE Marks. There will be Technical Paper Presentation (TPP) event conducted by R&D Cell and Project Exhibition (PE) event conducted by respective Departments as per the academic time table. Participation in these activities is mandatory. After evaluation Winners will be declared from TPP and PE events separately as per the rubrics, rules and regulations framed by R&D Cell and Department respectively however ISE marks are not allotted for these activities.

In order to keep proper evaluation record of the progress of project in the department; each BE Project Group should submit soft copy of report (approved by respective Guide) in the prescribed format of the Department before each phase of evaluation for ISE marks and one hard copy of the Report duly signed by respective Guide in prescribed format for ESE marks to Project co-ordinator.

The department should keep proper evaluation record of the progress of project and at the end of the semester it should be assessed for awarding ISE marks. The ISE Marks should be examined by approved internal faculty appointed by the head of Department on the basis of rubrics defined for each Phase of evaluation as per following but not limited to:

- Scope and objectives of the project work.
- Extensive Literature survey.
- Progress of the work (Continuous assessment)
- Design, implementation, and analysis of the project work.
- Results, conclusions and future scope.
- Report in prescribed format.



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For ESE Marks; an approved external examiner and internal examiner appointed by the head of the institute together will assess the Major Project during oral examination. The oral examination is a presentation by the group members on the project along with demonstration of the work done.

Each individual student should be assessed for his/her contribution, understanding and knowledge gained and the rubrics defined by department for awarding ISE and ESE marks.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETP71	Major Project II (Category I)	--	--	10	--	--	5	5
		Examination Scheme						
		ISE		MSE	ESE		Total	
		Phase-III:40 Phase-IV:40		--	20		100	

The final year students have already undergone first stage of Major Project I OR Major Project II work in their respective semesters and in this semester students are expected to continue the project work of stage I they need to separately carry literature survey, define problem, title of the project and objectives of project.

The project work will be internally evaluated in Phases (Phase III and Phase IV) by the Expert Groups in the Department consisting of Guide and two OR more than two domain expert faculties based on Scheme of examination for ISE Marks. There will be Technical Paper Presentation (TPP) event conducted by R&D Cell and Project Exhibition (PE) event conducted by respective Departments as per the academic time table. Participation in these activities is mandatory. After evaluation Winners will be declared from TPP and PE events separately as per the rubrics, rules and regulations framed by R&D Cell and Department respectively however ISE marks are not allotted for these activities.

In order to keep proper evaluation record of the progress of project in the department; each BE Project Group should submit soft copy of report (approved by respective Guide) in the prescribed format of the Department before each phase of evaluation for ISE marks and one hard copy of the Report duly signed by respective Guide in prescribed format for ESE marks to Project co-ordinator.

The department should keep proper evaluation record of the progress of project and at the end of the semester it should be assessed for awarding ISE marks. The ISE Marks should be examined by approved internal faculty appointed by the head of Department on the basis of rubrics defined for each Phase of evaluation as per following but not limited to:

- Scope and objectives of the project work.
- Extensive Literature survey.
- Progress of the work (Continuous assessment)
- Design, implementation, and analysis of the project work.
- Results, conclusions and future scope.
- Report in prescribed format.

For ESE Marks; an approved external examiner and internal examiner appointed by the head of the institute together will assess the Major Project during oral examination. The oral examination is a presentation by the group members on the project along with demonstration of the work done.

Each individual student should be assessed for his/her contribution, understanding and knowledge gained and the rubrics defined by department for awarding ISE and ESE marks.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETP71	Major Project I (Category II)	--	--	10	--	--	5	5
		Examination Scheme						
		ISE		MSE	ESE		Total	
		Phase-I:40 Phase-II:40		--	20		100	

The main intention of Major Project is to enable students to apply the knowledge and skills learned out of courses studied to solve/implement predefined practical problem mainly addressing the issues of society, an industry or a research. These students have already undergone project assignment in their pre-final year in Product Design I & Product Design II courses. Therefore Major Project work may may be based on the knowledge gained in the courses OR may be beyond the scope of curriculum of courses taken OR may be extension of the work done in Action Research Plan I and Action Research Plan II courses in pre-final year. The project area may be selected in which the student intend to do further education and/or may be either intending to have employment or self-employment. However thrust should be

- Learning additional skills, computational techniques.
- Development of ability to define, design, analysis and implementation of the problem and lead to its accomplishment with proper planning till the development of final deliverable end product (Hardware/Software) OR research publication in a reputed Conference/Journal.
- Learn the behavioral science by working in a group.

Students of final year are categorized as Category I (Internship) and Category II (Non-Internship) students. In final year these students groups will have to execute Major Projects. Execution and evaluation of Major Project will be done as Major Project I and Major Project II in respective semesters of Category I Category II students. If a Guide and a group of students of a particular Major Project wish then they can continue the work done as Major Project I and Major Project II in respective semesters as a part of Major Project. Execution and evaluation of Major Project will be done as per the BE Project Process developed at Institute level. The details of this process are available in Project Log Book.

At the end of Sem VI; students are required to finalize whether they wish to opt Category I (Internship) OR Category II (Non-Internship). Since these are separate group of students; students are required to form a BE Project Group within the category they have opted for. In order for the smooth execution and evaluation of Major Project; formation of a BE Project Group from students belonging to different categories will not be allowed at any circumstances. However in order to



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promote execution of interdisciplinary project; students from different departments but from the same category may execute the Major Project after the approval/agreement from respective Guides. Evaluation of these Project Groups will however be done on the basis of the work assigned to them OR their project objectives. A BE Project group of maximum three students will be allowed. Each project group will be completing a comprehensive project work based on the knowledge acquired from the courses studied. Each group will be assigned one faculty as a Guide as per Department policies. The project work will be internally evaluated based on Scheme of examination for ISE Marks in Phases (Phase I and Phase II) by the Expert Groups in the Department consisting of Guide and two OR more than two domain expert faculties .

The department should keep proper evaluation record of the progress of project and at the end of the semester it should be assessed for awarding ISE marks. The ISE Marks should be examined by approved internal faculty appointed by the head of the institute on the basis of rubrics defined for each Phase of evaluation as per following but not limited to:

- Scope and objectives of the project work.
- Extensive Literature survey.
- Progress of the work (Continuous assessment)
- Design, implementation, and analysis of the project work*.
- Results, conclusions and future scope*.
- Report in prescribed format*.

(*if Major Project I and II are separate)

For ESE Marks; an approved external examiner and internal examiner appointed by the head of the institute together will assess the Major Project during oral examination. The oral examination is a presentation by the group members on the project along with demonstration of the work done. Each individual student should be assessed for his/her contribution, understanding and knowledge gained and the rubrics defined by department for the awards of ISE and ESE marks.



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Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
ETP81	Major Project II (Category II)	--	--	10	--	--	5	5
		Examination Scheme						
		ISE		MSE	ESE		Total	
		Phase-III:40 Phase-IV:40		--	20		100	

The final year students have already undergone first stage of Major Project I OR Major Project II work in their respective semesters and in this semester students are expected to continue the project work of stage I then they need to separately carry literature survey, define problem, title of the project and objectives of project.

The project work will be internally evaluated in Phases (Phase III and Phase IV) by the Expert Groups in the Department consisting of Guide and two OR more than two domain expert faculties based on Scheme of examination for ISE Marks. There will be Technical Paper Presentation (TPP) event conducted by R&D Cell and Project Exhibition (PE) event conducted by respective Departments as per the academic time table. Participation in these activities is mandatory. After evaluation Winners will be declared from TPP and PE events separately as per the rubrics, rules and regulations framed by R&D Cell and Department respectively however ISE marks are not allotted for these activities.

In order to keep proper evaluation record of the progress of project in the department; each BE Project Group should submit soft copy of report (approved by respective Guide) in the prescribed format of the Department before each phase of evaluation for ISE marks and one hard copy of the Report duly signed by respective Guide in prescribed format for ESE marks to Project co-ordinator.

The department should keep proper evaluation record of the progress of project and at the end of the semester it should be assessed for awarding ISE marks. The ISE Marks should be examined by approved internal faculty appointed by the head of Department on the basis of rubrics defined for each Phase of evaluation as per following but not limited to:

- Scope and objectives of the project work.
- Extensive Literature survey.
- Progress of the work (Continuous assessment)
- Design, implementation, and analysis of the project work.
- Results, conclusions and future scope.



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- Report in prescribed format.

For ESE Marks; an approved external examiner and internal examiner appointed by the head of the institute together will assess the Major Project during oral examination. The oral examination is a presentation by the group members on the project along with demonstration of the work done.

Each individual student should be assessed for his/her contribution, understanding and knowledge gained and the rubrics defined by department for awarding ISE and ESE marks.