



**ELECTRONICS AND  
COMMUNICATIONS  
ENGINEERING**

# SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (AUTONOMOUS)

(AFFILIATED TO JNTUK, KAKINADA) (RECOGNISED BY ALL INDIA COUNCIL FOR TECH. EDN., NEW DELHI)

Accredited by NAAC with 'A' Grade Recognised as Scientific and Industrial Research Organisation  
CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

**Dr. M.Jagapathi Raju**

M.Tech. (IIT,KGP), Ph.D.(A.U), FIE,MISTE,

Vice- Principal (Academics)

and

PRINCIPAL (I/c.)



Phones: Off : EPABX :08816-223332 Ext.201

College :08816-222748

Fax:08816-224516

Mobile No.9848773515

Emails: [profmjraju999@gmail.com](mailto:profmjraju999@gmail.com)

[principal@srkrec.ac.in](mailto:principal@srkrec.ac.in)

Web Site : [www.srkrec.ac.in](http://www.srkrec.ac.in)

## PROCEEDINGS OF THE PRINCIPAL

Ref. No: SRKREC/Committee/BoS/ECE/4

Date: 01-08-2019

**Sub:** Appointment of BoS members for Electronics and Communication Engineering (ECE) department-Reg.

The following members are nominated as Board of Studies members for the Department of Electronics and Communication Engineering (ECE). This order will come into force with immediate effect until further orders.

S No	Name	Position in committee	Associated with
01	Dr. B.V.S.S.N. Raju	Chairman	Professor & HOD-ECE, SRKREC
02	Dr. B.T. Krishna	JNTUK Nominee	Professor & HOD, Dept. of ECE, JNTU Kakinada
03	Dr. A. Mallikarjuna Prasad	Experts from other Universities	Professor, Department of ECE, JNTUK
04	Prof. P. Mallikharjuna Rao		Professor of Department of ECE, Andhra University
05	Dr. N. V. S. Narasimha Sarma		Professor, Department of ECE, National Institute of Technology Warangal
06	Sri SVN NarayanaRao	Industry Expert	CEO, Salcit Technologies Pvt.
07	Dr. M.Chakravarty	Expert from Research Organization	Scientist G, DLRL Hyderabad
08	Prof. N.Venkateswara Rao	Faculty of each specialization	Professor, SRKREC
09	Prof.D.V.R.Mohan		Professor, SRKREC
10	Prof.P.Subba Rao		Professor, SRKREC
11	Prof. P.V. Rama Raju		Professor, SRKREC
12	Prof.N.Udaya Kumar		Professor, SRKREC
13	Prof.G.V.S Padma Rao		Professor, SRKREC
14	Prof.K.V.S.N.Raju		Professor, SRKREC
15	Sri M.Vijaya Rama Raju		Associate Prof., SRKREC
16	Sri S.S.Mohan Reddy		Associate Prof., SRKREC
17	Sri Y.Rama Lakshmana		Associate Prof., SRKREC
18	Student Representatives		

c.c.to:

1. The I/c. Principal's table
2. HOD-ECE
3. All the above Members 4 Office file.

PRINCIPAL  
S.R.K.R. Engg. College  
BHIMAVARAM-534 204



I/c. PRINCIPAL  
PRINCIPAL  
S.R.K.R. Engg. College  
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**Dr. M. Jagapathi Raju**

M.Tech (IIT, KGP), Ph.D (AU), FIE, MISTE

Vice-Principal (Academics)

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Phones: Off: 08816-223332 Ext. 201

College: 08816-222748

Fax: 08816-224516

Mobile No. : 9848773515, 9848381818

Email: profmjraju999@gmail.com

principal@srkrec.ac.in

principalsrkrec@gmail.com

Website: www.srkrec.ac.in

Date: 10.08.2019

SRKREC/BOS-1/ECE/2019-20

To

Dr. A. Mallikarjuna Prasad

Professor, Department of ECE

University College of Engineering Kakinada

JNTUK, Kakinada-533003.

Dear Sir,

Sub: S.R.K.R. Engineering College-Board of Studies Meeting-Reg.

\*\*\*

We take the privilege in inviting you for the Board of Studies Meeting in SRKR Engineering College as an External Expert Member. It is proposed to revise the existing syllabus and to implement the new Syllabus and Regulations (R19) from the 2019-20 admitted batches onwards. In this regard, we trust that you are the right person to contribute your valuable suggestion in revising the Curriculum.

In this connection, you are requested to attend the meeting of the Joint Board of Studies on 19.08.2019 at 11-00 A.M in I-Block, A.C. Auditorium of our college.

The Departmental Board of Studies meetings will be conducted in respective departments as per the schedule mentioned below:

S.No.	BOARD	DATE	TIME
1	Civil Engineering	19.08.2019	2.00 P.M
2	Computer Science & Engineering	19.08.2019	2.00 P.M
3	Electronics & Communication Engineering	19.08.2019	2.00 P.M
4	Electrical & Electronics Engineering	19.08.2019	2.00 P.M
5	Information Technology	19.08.2019	2.00 P.M
6	Mechanical Engineering	19.08.2019	2.00 P.M
7	Combined Board of Studies in Engineering Chemistry/Engineering Mathematics/Engineering Physics / Humanities and Social Sciences	19.08.2019	2.00 P.M

Hence, kindly accept our invitation and confirm your visit for attending the Board of Studies meeting.

The T.A / D.A. will be paid to all the external members as per the university guidelines. We request you to make it convenient to attend the meetings.

Yours Sincerely,

*(Signature)*

Principal (I/c)

I/c. Principal

**S.R.K.R. Engineering College  
(Autonomous)**

China Amiram, Bhimavaram-534 204.

Encl: Agenda of the Meeting

*(Signature)*

PRINCIPAL

**S.R.K.R. Engg. College**

**BHIMAVARAM-534 204**





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Email: profinjraju999@gmail.com

principal@srkrec.ac.in

principalsrkrec@gmail.com

Website: www.srkrec.ac.in

Date: 10.08.2019

SRKREC/BOS-1/ECE/2019-20

To

Prof. P.Mallikharjuna Rao

Professor of ECE

College of Engineering (A)

Andhra University

Visakhapatnam - 530003.

Dear Sir,

Sub: S.R.K.R. Engineering College-Board of Studies Meeting-Reg.

\*\*\*

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Yours Sincerely,

Principal (I/c)

**I/c. Principal**  
**S.R.K.R. Engineering College**  
**(Autonomous)**  
**China Amiram, Bhimavaram-534 204**

Encl: Agenda of the Meeting



PRINCIPAL  
S.R.K.R. Engg. College  
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principal@srkrec.ac.in  
principalsrkrec@gmail.com  
Website: www.srkrec.ac.in

Date: 10.08.2019

SRKREC/BOS-1/ECE/2019-20

To  
Sri SVN Narayana Rao  
CEO, Salcit Technologies Pvt. Ltd.  
Flat No. 2408, Sai Dream Castle  
Nizampet, Hyderabad-500090.

Dear Sir,

Sub: S.R.K.R. Engineering College-Board of Studies Meeting-Reg.

\*\*\*

We take the privilege in inviting you for the Board of Studies Meeting in SRKR Engineering College as an Industry Expert Member. It is proposed to revise the existing syllabus and to implement the new Syllabus and Regulations (R19) from the 2019-20 admitted batches onwards. In this regard, we trust that you are the right person to contribute your valuable suggestion in revising the Curriculum.

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Yours Sincerely,

Principal (I/c)

Encl: Agenda of the Meeting



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I/c. Principal  
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principalsrkrec@gmail.com

Website: www.srkrec.ac.in

SRKREC/BOS-1/ECE/2019-20

Date: 10.08.2019

To

Dr. B.T. Krishna

Professor of ECE & HOD

UCEK, JNTU Kakinada

Kakinada-533 003.

Dear Sir,

Sub: S.R.K.R. Engineering College-Board of Studies Meeting-Reg.

\*\*\*

We take the privilege in inviting you for the Board of Studies Meeting in SRKR Engineering College as a University nominee. It is proposed to revise the existing syllabus and to implement the new Syllabus and Regulations (R19) from the 2019-20 admitted batches onwards. In this regard, we trust that you are the right person to contribute your valuable suggestion in revising the Curriculum.

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Yours Sincerely,

Principal (I/c)

I/c. Principal

S.R.K.R. Engineering College  
(Autonomous)

China Amiram, Bhimavaram-534 204.

Encl: 1. Copy of JNTUK Nomination Letter

2. Agenda of the Meeting

PRINCIPAL  
S.R.K.R. Engg. College  
BHIMAVARAM-534 204.







**SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE(A)**  
**CHINNA AMIRAM :: BHIMAVARAM-534204**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

Dt: 16-08-2019

**CIRCULAR**

This is to inform you that the Department of ECE has convened a meeting on 19-08-2019 at 2 PM in the ECE Department Library. In this connection, all the Board of Studies members are requested to attend the same.

**Agenda:**

1. Approval of Syllabus for the first year courses B.Tech.(R19) and M.Tech.(R19) related to the respective branches as per the schemes approved in the Joint Board.
2. Approval of Schemes for B.Tech.(R19) 2nd, 3rd and 4 th years and schemes for M.Tech (R19) 2nd year.
3. Any other item with the permission of the chair.

*H. Nagapathi Reddy*

PRINCIPAL  
S.R.K.R. Engg. College  
BHIMAVARAM-534 204.

*B. S. R. B.*

Head of the Department  
Head of ECE Department  
S.R.K.R. Engg. College  
BHIMAVARAM-534 204

C.C to:

1. The Members of Board of studies
2. Office file

**SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE  
(AUTONOMOUS)**

**BOARD OF STUDIES MEETING of ECE Department on 19-08-2019 at 2.00P.M. in**

**ECE Department Library**

**AGENDA**

1. Approval of Syllabus for the first year courses B.Tech (R19) & M.tech (R19) related to the respective branches as per the schemes approved in the Joint Board.
2. Approval of Schemes for B.Tech (R19) 2<sup>nd</sup>, 3<sup>rd</sup>, and 4th years and schemes for M.Tech (R19) 2<sup>nd</sup> year.
3. Any other item with the permission of the Chair.

*B. S. Reddy*

*H. Nagapathi Reddy*

**PRINCIPAL  
S.R.K.R. Engg. College  
BHIMAVARAM-534 204.**



**SRKR ENGINEERING COLLEGE (A) CHINNA AMIRAM BHIMAVARAM-534204**  
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**  
**BOARD OF STUDIES MEMBERS**

S. No	Category	Name	Position	Phone No.	Email Id
1	Chairman	Dr. B.V.S.S.N. Raju	Professor & Head, Dept. of ECE SRKR Engineering College	9441907761	<a href="mailto:ecehod2019.srkrec@gmail.com">ecehod2019.srkrec@gmail.com</a> <a href="mailto:dcraju123@gmail.com">dcraju123@gmail.com</a>
2	JNTUK Nominee	Dr. B.T. Krishna	Professor & HOD, Dept. of ECE, University College of Engineering Kakinada (UCEK), JNTU Kakinada	9848992922	<a href="mailto:tkbattula@gmail.com">tkbattula@gmail.com</a>
	JNTUK Member	Dr. A. Mallikarjuna Prasad	Professor, Department of ECE University College of Engineering Kakinada JNTUK, Kakinada-533003.	9441564840 9963993504	<a href="mailto:a_malli65@yahoo.com">a_malli65@yahoo.com</a> <a href="mailto:a_malli65@jntucek.ac.in">a_malli65@jntucek.ac.in</a>
3	Experts from other Universities	Prof. P. Mallikharjuna Rao	Professor of Department of ECE, College of Engineering (A), Andhra University Visakhapatnam - 530003.	9247149013	<a href="mailto:pmraoaece@yahoo.com">pmraoaece@yahoo.com</a>
		Dr. N.V.S. Narasimha Sarma	Professor, Department of Electronics & Communication Engineering National Institute of Technology Warangal Warangal-506004, Telangana.	9849639262 8702462412	<a href="mailto:sarma@nitw.ac.in">sarma@nitw.ac.in</a>
5	Industry Expert	Sri SVN Narayana Rao	CEO, Salcit Technologies Pvt. Ltd., Flat No. 2408, Sai Dream Castle, Nizampet, Hyderabad- 500090	9945399533	<a href="mailto:svn@salcit.in">svn@salcit.in</a>
6	Expert from Research Organization	Dr. M. Chakravarty	Scientist G, DLRL Chandrayangutta, Hyderabad- 500005.	9490796232	<a href="mailto:cv_mada@yahoo.co.in">cv_mada@yahoo.co.in</a>

*H. Jagapathi Reddy*

**PRINCIPAL**  
**S.R.K.R. Engg. College**  
**BHIMAVARAM-534 204.**

S. No	Category	Name	Position	Phone No.	Email Id
7	Faculty of each specialization	Prof. N. Venkateswara Rao	Professor, Dept. of ECE SRKR Engineering College	9490031988	vrnagalla@gmail.com
8		Prof. D.V.R. Mohan	Professor, Dept. of ECE SRKR Engineering College	9490629574	dvr_mohan2001@yahoo.com
9		Prof. P. Subba Rao	Professor, Dept. of ECE SRKR Engineering College	9848226424	patsrao@rediffmail.com
10		Dr. P.V. Rama Raju	Professor, Dept. of ECE SRKR Engineering College	9010144688	pvrāju50@gmail.com
11		Dr. N. Udaya Kumar	Professor, Dept. of ECE SRKR Engineering College	9440354093	n_uk2007@yahoo.com
12		Prof. G.V.S. Padma Rao	Professor, Dept. of ECE SRKR Engineering College	9848466678	gvspadmarao@gmail.com
13		Dr. K.V.S.N. Raju	Professor, Dept. of ECE SRKR Engineering College	9848073465	kvsn45@gmail.com
14		Sri M. Vijaya Rama Raju	Associate Professor Dept. of ECE SRKR Engineering College	9492917958	mvrr_srkr@rediffmail.com
15		Dr. S.S. Mohan Reddy	Associate Professor Dept. of ECE SRKR Engineering College	9849238118	rahulmohan720@gmail.com
16		Sri Y. Rama Lakshmana	Associate Professor Dept. of ECE SRKR Engineering College	9989916816	yrjohnson@gmail.com
17	Student Representatives	Ms. K.N.K. Bhagyasri	M.Tech Student <i>Bhagyasri</i>	8328673856	bhagyasrikagitha@gmail.com
18		Ms. L. Mounika	M.Tech Student	7337242904	mounikasanjeev97feb@gmail.com
19		Ms. Balla Durga Bhavani	B.Tech Student <i>B. Durga Bhavani</i>	7013787471	ballabhavani99@gmail.com
20		Mr. Ch. Viswa Prasanth	B.Tech Student <i>Ch. Viswanth</i>	8500356218	Viswaprasanth17@gmail.com

Date: 19-08-2019

*H. Nagapalle. Reddy*

PRINCIPAL  
S.R.K.R. Engg. College  
BHIMAVARAM-536 206.

*B.S.R.*



# BOS meeting for ECE

on 19-08-2017  
at 2 PM

Members Present	Signature
① Dr. B.T. Krishna Professor & HOD, Dept of ECE JNTUK Kakinada	B.T. Krishna
② Dr. A. Mallikarjuna Poasad Professor, Dept of ECE, JNTUK Kakinada	A.M. Poasad
③ Dr. P. Mallikharjuna Rao, Professor, Dept of ECE Andhra University	P. Mallikharjuna Rao
④ Sri S.V. Narayana Rao, CEO, Satech Technologies, Pvt Ltd, Hyderabad	S.V. Rao
⑤ Prof N. Venkateswara Rao	N. Venkateswara Rao
⑥ Prof D. V. R. Mohan	D. V. R. Mohan
⑦ Dr P. V. Rama Raju	P. V. Rama Raju
⑧ Dr N. Udaya Kumar	N. Udaya Kumar
⑨ Prof G. V. S. Perdina Rao	G. V. S. Perdina Rao
⑩ Dr K. V. S. N. Raju	K. V. S. N. Raju
⑪ Sri H. Vijaya Rama Raju	H. Vijaya Rama Raju
⑫ Dr S. S. Mohan Reddy	S. S. Mohan Reddy
⑬ Sri Y. Rama Lakshmana	Y. Rama Lakshmana
⑭ Dr. B. V. S. S. N. Raju Profess & Head, ECE Dept.	B. V. S. S. N. Raju

## RESOLUTIONS:

1. As per the schemes approved in the Joint BOS meeting, syllabus of first year B.Tech (R19) & first year M.Tech (R19) is approved.
2. The syllabus is revised. The curriculum feedback is taken from stakeholders in the year 2018.

H. Nagappa Reddy

PRINCIPAL  
S.A.K.R. Engg. College  
BHIVARAM-533 305.

Resolution with reference :19-08-2019

(Regulation R19)

I/IV B.TECH I-SEMESTER

Subject Code	Category	L	T	P	C	LM	E.M	Exam
B19BS1101	BS	3	--	--	3	25	75	3 Hrs.
<b>MATHEMATICS-I</b>								
<b>(LINEAR ALGEBRA, DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS)</b>								
<b>(Common to All Branches)</b>								
<b>Pre-requisites:</b> Calculus of functions of a single variable and Matrices.								
<b>Course Objectives:</b> Students are expected to learn								
1.	Concepts of linear algebra and methods of solution of linear simultaneous algebraic equations.							
2.	Eigen values, Eigen vectors and quadratic forms.							
3.	First order ordinary differential equations and some simple geometrical and physical applications.							
4.	Orthogonal trajectories, Simple electrical circuits and Newton's law of cooling.							
5.	Methods of solution of linear higher order ordinary differential equations.							
6.	Concepts of Laplace transform and their applications for solving ODE.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Solve a given system of linear algebraic equations							K2
2.	Determine Eigen values and Eigen vectors of a system represented by a matrix.							K2
3.	Solve linear ordinary differential equations of first order and first degree.							K1
4.	Apply the knowledge in simple applications such as Newton's law of cooling, orthogonal trajectories and simple electrical circuits.							K3
5.	Solve linear ordinary differential equations of second order and higher order.							K1
6.	Determine Laplace transform and inverse Laplace transform and solve linear ODE.							K2
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs)</b>	<b>Linear systems of equations:</b> Rank, Echelon form, Normal form, consistency of system of linear equations, Solution of linear systems by Gauss elimination, Jacobi and Gauss-Seidel methods.							
<b>UNIT-II</b> <b>(10 Hrs)</b>	<b>Eigen values - Eigen vectors and Quadratic forms:</b> Eigen values, Eigen vectors, Properties, Cayley-Hamilton theorem, Inverse and powers of a matrix using Cayley-Hamilton theorem, Reduction to diagonal form, Quadratic forms, Reduction of a Quadratic form to Canonical form.							
<b>UNIT-III</b> <b>(10 Hrs)</b>	<b>Differential equations of first order and first degree:</b> Linear, Bernoulli, Exact, Reducible to exact types. Applications: Orthogonal trajectories, Newton's Law of cooling, Simple electrical circuits. (R-L and R-C circuits only)							

*H. Jagapathi Reddy*

2019-2020  
B.TECH I SEMESTER  
MATHS-I



<b>UNIT-IV (8 Hrs)</b>	<b>Linear differential equations of higher order:</b> Linear Non-homogeneous equations of higher order with constant coefficients with source (RHS) term of the type $e^{ax}$ , $\sin ax$ , $\cos ax$ , polynomials in $x$ , $e^{ax}V(x)$ , $x V(x)$ . Simultaneous differential equations with constant coefficients, Method of Variation of parameters.
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*H. Jagapathi Reddy*

**PRINCIPAL  
S.R.K.R. Engg. College  
SHIMAVARAM-534 204.**

<b>UNIT-V (12 Hrs)</b>	<p><b>Laplace transformation:</b> Laplace transforms of standard functions, properties, transforms of <math>tf(t)</math>, <math>f(t)/t</math>, transforms of derivatives and integrals, transforms of unit step function, Dirac delta function, Inverse Laplace transforms, convolution theorem (without proof). Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.</p>
<b>Text Books:</b>	
1.	B.S.Grewal, Higher Engineering Mathematics, 43 <sup>rd</sup> Edition, Khanna Publishers.
2.	N.P.Bali&Manish Goyal, Engineering Mathematics, Lakshmi Publications.
<b>Reference Books:</b>	
1.	V.Ravindranath&P. Vijayalakshmi, Mathematical Methods, Himalaya Publishing House.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10 <sup>th</sup> Edition, Wiley-India.
3.	Michael Greenberg, Advanced Engineering Mathematics, 9 <sup>th</sup> edition, Pearson.
4.	Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press.
5.	Peter O'Neil, Advanced Engineering Mathematics, Cengage Learning.
6.	Srimanta Pal, SubodhC.Bhunia, Engineering Mathematics, Oxford University Press.
7.	Dass H.K., RajnishVerma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, New Delhi.

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1102	BS	3	--	--	3	25	75	3 Hrs.

**MATHEMATICS – II**

**(NUMERICAL ANALYSIS, PARTIAL DIFFERENTIAL EQUATIONS)**

**(Common to CSE, ECE & IT)**

**Pre requisites:** Calculus of functions of a single variable and Geometry

**Course Objectives:** Students are expected to learn:

1. The concept of interpolation and its use for equally and unequally spaced data points
2. Numerical methods to solve algebraic and transcendental equations, methods for numerical evaluation of integrals and for solving first order ODEs.
3. Partial differentiation and Jacobians.
4. Application of Partial differentiation for maxima/ minima and for evaluation of real definite integrals.
5. Formation and solution of linear partial differential equations
6. Solution of one-dimensional wave equation and one-dimensional heat equation by the method of separation of variables.

**Course Outcomes:** At the end of the course students will be able to

S.No	Outcome	Knowledge Level
1.	Fit an interpolation formula and perform interpolation for an equally spaced data as well as unequally spaced data.	K2
2.	Find a real root of algebraic and transcendental equations, evaluate numerically certain definite integrals & solve a first order ordinary differential equation by Euler and RK methods.	K3
3.	Compute partial derivatives, total derivative and Jacobian	K1
4.	Find maxima/minima of functions of two variables and evaluate some real definite integrals.	K2
5.	Form partial differential equations and solve Lagrange linear equation. Solve linear higher order homogeneous and non-homogeneous PDEs.	K1
6.	Find theoretical solution of one-dimensional wave equation and one-dimensional heat equation	K3


**SYLLABUS**

<b>UNIT-I (10 Hrs)</b>	<b>Interpolation:</b> Interpolation, forward differences, backward differences, Central differences and relations between the operators, Differences of a polynomial, Newton's formulae for interpolation, Interpolation with unequal intervals, Lagrange interpolation.
<b>UNIT-II (12 Hrs)</b>	<b>Solution of Algebraic and Transcendental Equations &amp; Numerical Integration and solution of Ordinary Differential equations:</b> Introduction, Bisection method, Method of false position, Iteration method & Newton-Raphson method. Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ rule, Solution of ordinary differential equations by Taylor's method, Picard's method, Euler's method, Modified Euler's method, Fourth order

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	Runge-Kutta method.
<b>UNIT-III (10 Hrs)</b>	<b>Partial differentiation:</b> Introduction, Homogeneous functions, Euler's theorem, Chain rule, Total derivative, Jacobians and their properties. Applications: Taylor series expansion for a function of two variables, Maxima and Minima of functions of two variables with and without constraints, Lagrange's method. Leibnitz's rules for differentiation under integral sign.
<b>UNIT-IV (10 Hrs)</b>	<b>First order and higher order partial differential equations:</b> Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of Lagrange linear equation. Solutions of Linear homogeneous and non-homogeneous partial differential equations with constant coefficients –source (RHS) terms of the type $e^{ax+by}$ , $\sin(ax+by)$ , $\cos(ax+by)$ , $x^m y^n$ .
<b>UNIT-V (10 Hrs)</b>	<b>Applications of partial differential equations:</b> Method of separation of variables, One –dimensional wave equation, the D'Alembert's solution, one- dimensional heat equation
<b>Text Books:</b>	
1.	B.S.Grewal, Higher Engineering Mathematics, 43 <sup>rd</sup> Edition, Khanna Publishers.
2.	N.P.Bali & Manish Goyal, A Text book of Engineering Mathematics, Lakshmi Publications.
<b>Reference Books:</b>	
1.	Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press.
2.	V.Ravindranath and P. Vijayalakshmi, Mathematical Methods, Himalaya Publishing House.
3.	Erwin Kreyszig, Advanced Engineering Mathematics, 10 <sup>th</sup> Edition, Wiley-India.
4.	David Kincaid, Ward Cheney, Numerical Analysis-Mathematics of Scientific Computing, 3 <sup>rd</sup> Edition, Universities Press.
5.	Srimanta Pal, Subodh C. Bhunia, Engineering Mathematics, Oxford University Press.
6.	Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, New Delhi.

  
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Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1105	BS	3	--	--	3	25	75	3 Hrs.

**APPLIED CHEMISTRY**  
(Common to CSE,ECE & IT)

**Course Objectives:**

1.	To understand the physical and mechanical properties of Polymers/Plastics/elastomers helps in selecting suitable materials for different purpose.
2.	To create awareness on fuels as a source of energy for industries like thermal power stations, steel industry, fertilizer industry etc.
3.	To understand the concept of galvanic cells and corrosion with theories like electro chemical theory.
4.	To understand the importance of water.
5.	To understand about the materials which are used in major industries like steel and metallurgical manufacturing industries, construction and electrical equipment manufacturing industries.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1	At the end of the course the students learn the advantages and limitations of plastics materials and their use in design.	K3
2	Fuels which are used commonly and their economics, advantages and limitations are discussed.	K3
3	Students gained knowledge reasons for corrosion and some methods of corrosion control.	K3
4	Students understands the impurities present in raw water, problems associated with them and how to avoid them.	K3
5	Similarly students understand liquid crystals and semi conductors. Students can gain the building materials, solar materials, lubricants and energy storage devices.	K4

**SYLLABUS**

<b>UNIT-I (10 Hrs)</b>	<p><b>High Polymers and Plastics; Rubbers &amp; Elastomers</b>  Polymerization Definition, Types of Polymerization, free radical Mechanism of addition polymerization, Plastics as engineering materials, Thermoplastics and Thermosetting plastics, Compounding of plastics, Fabrication of plastics (4 techniques); Preparation, Properties and applications of Polyethylene, PVC, Bakelite, Nylon - 6,6, Bullet Proof plastics -polycarbonate and Kelvar; Fiber reinforced plastics, conducting polymers, Biodegradable Polymers - PHBV, Nylon 2, Nylon 6.  Natural rubber – Vulcanization – Compounding of Rubber; Preparation, properties and applications of Buna – S; Buna – N;</p>
<b>UNIT-II (9 Hrs)</b>	<p><b>Energy Sources and Applications</b>  <b>Nuclear Energy:</b> Nuclear fission and Nuclear fusion – Nuclear Power reactor – Applications of radioactive materials Solar Photovoltaic cell- Thermal fuels – Introduction – Classification – Calorific value – HCV and LCV – Bomb calorimeter; Coal : Proximate and</p>

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	ultimate analysis of coal – Significance of the analysis – Manufacture of coke by Otto Hoffman’s by Product Process , Refining crude oil; Knocking; Chemical structure Knocking, Octane number of glassline, Cetane number of diesel oil, synthetic Petrol; LPG, CNG
<b>UNIT-III (11 Hrs)</b>	<b>Electrochemical cells and Corrosion</b> Galvanic cell, single electrode potential, Calomel electrode; Modern batteries: - Lead – Acid battery; Fuel cells- Hydrogen – Oxygen fuel cell, Lithium battery Theories of corrosion (i) dry Corrosion (ii) wet corrosion. Types of corrosion - differential aeration corrosion, pitting corrosion, galvanic corrosion, stress corrosion, Factors influencing corrosion, Protection from corrosion-material selection & design, cathodic protection, Protective coatings- metallic coatings – Galvanizing, Tinning, Electroplating; Electroless plating ; Paints.
<b>UNIT-IV (8 Hrs)</b>	<b>Water technology</b> Sources of water – Hardness of water – Estimation of hardness of water by EDTA method; Boiler troubles – sludge and scale formation, Boiler corrosion, caustic embrittlement, Priming and foaming; Softening of water by Lime – Soda Process, Zeolite Process, Ion – Exchange Process; Municipal water treatment; Desalination of sea water by Electrodialysis and Reverse osmosis methods. Indian standards and WHO standards of drinking water. Design of drinking water plant.
<b>UNIT-V (12 Hrs)</b>	<b>Chemistry of Engineering Materials&amp; Advanced Engineering materials</b> Cement:- Manufacture of Portland cement, setting and hardening of cement, Deterioration of cement concrete. Refractories: - Definition, Characteristics, classification, Properties and failure of refractories. Solar Energy: - Construction and working of Photovoltaic cell, applications. Solid State Materials: Crystal imperfections, Semi Conductors, Classification and chemistry of semi conductors: Intrinsic semiconductors; Extrinsic semiconductors; Defect semiconductors, Compound Semiconductors and Organic Semiconductors. Liquid Crystals: - Definition – Classification with examples – Applications.
<b>Text Books:</b>	
1.	Engineering Chemistry by Jain and Jain, DhanpatRai Publishing co.
2.	Engineering Chemistry by Willy India Pvt Ltd.
3.	Engineering chemistry by Dr.K.Anji Reddy and Dr.M.S.R.Reddy ; Silicon Publications.
<b>Reference Books:</b>	
1.	Engineering Chemistry by ShikhaAharwal; Cambridge University Press, 2015 edition.
2.	A text of Engineering Chemistry by S.S.Dara; S.Chand& Co Ltd.
3.	Chemistry in Engineering and Technology by JC Kuriacose and J. Rajaram Mc. Graw Hill edition.

  
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Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS1102	ES	3	--	--	3	25	75	3 Hrs.

**PROGRAMMING FOR PROBLEM SOLVING USING C**  
(Electronics & Communication Engineering)

**Course Objectives:**

1. To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2. To gain knowledge of the operators, selection, control statements and repetition in C
3. To learn about the design concepts of arrays, strings, enumerated structure and union types. To learn about their usage.
4. To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5. To assimilate about File I/O and significance of functions

**Course Outcomes :**

S.No	Outcome	Knowledge Level
1	The student will learn about computer systems, computing environments, developing of a computer program and Structure of a C Program	K2
2	The student will learn to use different operators, data types and loops for developing C Programs.	K3
3	The student will able to write programs using Arrays and Strings	K3
4	To design and implement programs to analyze the different pointer applications	K3
5	To decompose a problem into functions and to develop modular reusable code	K3

**SYLLABUS**

<b>UNIT-I</b> (10 Hrs)	<p><b>Introduction to Computers:</b> Computer Systems, Computing Environments, Computer languages, Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers</p> <p><b>Introduction to the C Language:</b> Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.</p> <p><b>Structure of a C Program:</b> Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.</p>
<b>UNIT-II</b> (9 Hrs)	<p><b>Bitwise Operators:</b> Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.</p> <p><b>Selection &amp; Making Decisions:</b> Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions</p> <p><b>Repetition:</b> Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping; Looping Applications, Programming Examples</p>

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<b>UNIT-III (10 Hrs)</b>	<p><b>Arrays:</b> Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages</p> <p><b>Strings:</b> String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code</p> <p><b>Enumerated, Structure, and Union:</b> The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application</p>
<b>UNIT-IV (10 Hrs)</b>	<p><b>Pointers:</b> Introduction, Pointers to pointers, Compatibility, L value and R value</p> <p><b>Pointer Applications:</b> Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application</p> <p><b>Processor Commands:</b> Processor Commands</p>
<b>UNIT-V (12 Hrs)</b>	<p><b>Functions:</b> Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion</p> <p><b>Text Input / Output:</b> Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions</p> <p><b>Binary Input / Output:</b> Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.</p>
<b>Text Books:</b>	
1.	Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE
2.	The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2e, Pearson
3.	Programming in C, Reema Thareja, OXFORD
<b>Reference Books:</b>	
1.	Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill
2.	Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
3.	Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19EC1101	ES	3	--	--	3	25	75	3 Hrs.

**BASIC ELECTRONICS**  
(Electronics & Communications Engineering)

**Course Objectives:**

1. To give exposure on the semiconductor physics of the intrinsic and extrinsic semiconductors and basics of various diodes.
2. To give exposure on various passive components, circuit theorems and common meters.
3. To give exposure on the fundamentals of BJT and IC's.
4. To give exposure on the concepts of number systems, logic gates and flip flops.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1	Understand the basic concepts of charge carriers in semi conductors, drift and diffusion current densities.	K1
2	Identify various passive components and understand the concept of KVL and KCL.	K3
3	Understand the structure and operation of various diodes, rectifier circuits.	K3
4	Understand the characteristics of BJT in CE,CB,CC configurations and IC fabrication.	K1
5	Understand the concept of number systems, logic gates and flip flops.	K4

**SYLLABUS**

<b>UNIT-I</b> (10 Hrs)	<b>Semiconductor Materials and Properties :</b> Classification of Materials, Intrinsic and Extrinsic semiconductors, Conduction in semiconductors, Charge mobility, Charge densities, Diffusion current density, Drift current density, Hall effect.
<b>UNIT-II</b> (9 Hrs)	<b>Passive Components and Basic Meters:</b> Types of passive components, Types of resistors, Resistor color code, Capacitors, Concept of charging and discharging, Types of capacitances, Inductors, Mutual inductance, Inductance of two coils, KCL, KVL, Voltmeter, Ammeter, Multimeter, Basics of CRO.
<b>UNIT-III</b> (10 Hrs)	<b>Fundamentals of Diodes and Special diodes:</b> Elementary concepts, V-I characteristics and applications of PN junction diode, Varactor diode, Zener diode, LED, Photo diode, Rectifiers: Half Wave and Full Wave with and without Capacitor filters.
<b>UNIT-IV</b> (10 Hrs)	<b>Fundamentals of Transistors and Integrated Circuits (IC):</b> Transistor construction, Basic Operation, Input and Output characteristics, Transistor in three configurations and their comparison, Introduction to Integrated Circuits, Classification of ICs and fabrication of Monolithic ICs.

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<b>UNIT-V (12 Hrs)</b>	<b>Introduction to Number Systems and Boolean Algebra.</b> Number Systems: Binary, Decimal, Octal, HexaDecimal, Logic gates: AND, OR, NOT, XOR, NAND and NOR, Flip Flops - RS Flip Flop, JK Flip Flop, T Flip Flop, D Flip Flop and Latches.
<b>Text Books:</b>	
1.	Electronic Devices and Circuits Theory by Robert L. Boylestad & Louis Nashelsky, PHI edition
2.	Electronic Devices and Circuits: An Introduction, Alan Mottershead, PHI Edition.
<b>Reference Books:</b>	
1.	Basic Electronics by Bernard Grob, 4th edition, International Student edition, MCGraw Hill publishers.
2.	Electronic Devices and Circuits by SanjeevGuptha, DhanapatRai publications.

  
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Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1108	BS	--	--	3	1.5	20	30	3 Hrs.
<b>APPLIED CHEMISTRY LAB</b>								
<b>(Common to CSE,ECE &amp; IT)</b>								
<b>Course Objectives:</b>								
1.	To investigate and understand Physical behaviour in the laboratory using scientific reasoning and logic and interpret the result of simple experiments and demonstration of chemical Principle and also evaluate the impact of chemical discoveries on how we view the world.							
2.	Effectively communicate experimental results and solutions to application problems through oral and written reports.							
3.	Understand the basic concepts, definitions, characteristics and phenomena.							
4.	Recognize the classical ideas and chemical phenomena and also define and analyse the concepts.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	An understanding of Professional and develop confidence on recent trends.							K3
2.	Able to gain technical knowledge of measuring, operating and testing of chemical instruments and equipments.							K4
3.	Acquire ability to apply real time knowledge of chemistry.							K3
4.	Exposed to the real time working environment.							K3
5.	Demonstrate the ability to learn Principles, design and conduct experiments.							K3
6.	Ability to work on laboratory and multidisciplinary tasks.							K3
<b>LIST OF EXPERIMENTS</b>								
1.	Introduction of Chemistry Laboratory.							
2.	Estimation of HCL using standard Sodium Hydroxide.							
3.	Determination of total hardness of water by EDTA method.							
4.	Estimation of Ferrous Iron by $KMnO_4$ .							
5.	Estimation of oxalic acid by $KMnO_4$ .							
6.	Estimation of Mohr's salt by $K_2Cr_2O_7$ .							
7.	Estimation of Dissolved oxygen by Winkler's method.							
8.	Determination of pH by pH meter and universal indicator method.							
9.	Conductometric titration of strong acid Vs strong base.							
10.	Conductometric titration of strong acid Vs weak base.							
11.	Potentionmetric titration of strong acid Vs strong base.							
12.	Potentionmetric titration of strong acid Vs weak base.							
13.	Preparation of Phenol formaldehyde resin.							
14.	Determination of saponification value of oils.							
15.	Determination of pour and cloud points of lubricating oil.							
16.	Determination of Acid value of oil.							
<b>Demo:</b>								
1.	Biodiesel from used cooking oil.							
2.	Construction of electrochemical cells.							
3.	Synthesis of semiconductors.							

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<b>Reference Books:</b>	
1.	Engineering Chemistry Lab Manual Prepared by Chemistry Faculty of S.R.K.R.Engineering College.
2.	Laboratory manual on Engineering Chemistry by Dr.Sudha Rani; DhanpatRai Publishing Company.
3.	Engineering Chemistry Laboratory manual – I & II by Dr.K.Anji Reddy; Tulip Publications.

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19HS1102	HS	--	--	3	1.5	20	30	3 Hrs.

**ENGLISH LAB**  
(Common to All Branches)

**Course Objectives:**

1.	Students will be exposed to a variety of self instructional, learner friendly modes of language learning
2.	Students will be habituated to CALL (Computer Assisted Language Learning). Thus providing them with the required facility to face computer-based competitive exams like GRE, TOEFL, GMAT etc.
3.	Students will learn better pronunciation through stress, intonation and rhythm
4.	Students build their confidence in speaking skills.
5.	Students learn and practice LSRW Skills.

**Course Outcomes:**

S.No	Outcome	Knowledge Level
1	Remember and understand the different aspects of English language proficiency with emphasis on LSRW skills.	K2
2	Apply communication skills through various language learning activities.	K3
3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening comprehension.	K4
4	Exhibit an acceptable etiquette essential in social settings.	K6
5	Get awareness on mother tongue influence and neutralize it in order to improve fluency and clarity in spoken English.	K4

**SYLLABUS**

<b>UNIT-I</b>	Pronunciation Letters and Sounds The Sounds of English Phonetic Transcription
<b>UNIT-II</b>	Past tense markers Word stress-di-syllabic words Poly-syllabic words
<b>UNIT-III</b>	Rhythm & Intonation
<b>UNIT-IV</b>	Contrastive Stress (Homographs)
<b>UNIT-V</b>	Word Stress: Weak and Strong forms Stress in compound words

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<b>Text Books:</b>	
1.	Infotech English, MaruthiPublications
<b>Reference Books:</b>	
1.	Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2.	English Pronunciation in use- Mark Hancock, CUP.
3.	English Phonetics and Phonology-Peter Roach, CUP.
4.	English Pronunciation in use- Mark Hewings, CUP.
5.	English Pronunciation Dictionary- Daniel Jones, CUP.
6.	English Phonetics for Indian Students- P. BalaSubramanian, Mac MillanPublications

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19CS1105	ES	--	--	3	1.5	20	30	3 Hrs.
<b>PROGRAMMING FOR PROBLEM SOLVING USING C LAB</b>								
<b>(Electronics &amp; Communication Engineering)</b>								
<b>Course Objectives:</b>								
1.	Apply the principles of C language in problem solving.							
2.	To design flowcharts, algorithms and knowing how to debug programs.							
3.	To design & develop of C programs using arrays, strings pointers & functions.							
4.	To review the file operations, preprocessor commands.							
<b>Course Outcomes: By the end of the Lab, the student</b>								
S.No	Outcome							Knowledge Level
1.	Gains Knowledge on various concepts of a C language.							K2
2.	Able to draw flowcharts and write algorithms.							K2
3.	Able design and development of C problem solving skills.							K3
4.	Able to design and develop modular programming skills.							K3
5.	Able to trace and debug a program							K3
<b>LIST OF EXPERIMENTS</b>								
<b>Exercise 1:</b>								
1.	Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.							
2.	Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.							
3.	Write a C program to display multiple variables.							
<b>Exercise 2:</b>								
1.	Write a C program to calculate the distance between the two points.							
2.	Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".							
<b>Exercise 3:</b>								
1.	Write a C program to convert a string to a long integer.							
2.	Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.							
3.	Write a C program to calculate the factorial of a given number.							
<b>Exercise 4:</b>								
1.	Write a program in C to display the n terms of even natural number and their sum.							
2.	Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.							
3.	Write a C program to check whether a given number is an Armstrong number or not.							

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<b>Exercise 5:</b>	
1.	Write a program in C to print all unique elements in an array.
2.	Write a program in C to separate odd and even integers in separate arrays.
3.	Write a program in C to sort elements of array in ascending order.
<b>Exercise 6:</b>	
1.	Write a program in C for multiplication of two square Matrices.
2.	Write a program in C to find transpose of a given matrix.
<b>Exercise 7:</b>	
1.	Write a program in C to search an element in a row wise and column wise sorted matrix.
2.	Write a program in C to print individual characters of string in reverse order.
<b>Exercise 8:</b>	
1.	Write a program in C to compare two strings without using string library functions.
2.	Write a program in C to copy one string to another string.
<b>Exercise 9:</b>	
1.	Write a C Program to Store Information Using Structures with Dynamically Memory Allocation
2.	Write a program in C to demonstrate how to handle the pointers in the program.
<b>Exercise 10:</b>	
1.	Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.
2.	Write a program in C to add two numbers using pointers.
<b>Exercise 11:</b>	
1.	Write a program in C to add numbers using call by reference.
2.	Write a program in C to find the largest element using Dynamic Memory Allocation.
<b>Exercise 12:</b>	
1.	Write a program in C to swap elements using call by reference.
2.	Write a program in C to count the number of vowels and consonants in a string using a pointer.
3.	
<b>Exercise 13:</b>	
1.	Write a program in C to show how a function returning pointer.
2.	Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc( ) function.
<b>Exercise 14:</b>	
1.	Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above two programs
2.	Write a program in C to convert decimal number to binary number using the function.

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<b>Exercise 15:</b>	
1.	Write a program in C to check whether a number is a prime number or not using the function.
2.	Write a program in C to get the largest element of an array using the function.
<b>Exercise 16:</b>	
1.	Write a program in C to append multiple lines at the end of a text file.
2.	Write a program in C to copy a file in another name.
3.	Write a program in C to remove a file from the disk.
<b>Reference Books:</b>	
1.	Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, CENGAGE
2.	The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, 2e, Pearson
3.	Programming in C, Reema Thareja, OXFORD
4.	Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill
5.	Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson
6.	Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19MC1102	MC	3	--	--	--	--	--	--
<b>CONSTITUTION OF INDIA</b>								
<b>(Common to ECE &amp; EEE)</b>								
<b>Course Objectives:</b>								
1.	To Enable the student to understand the importance of constitution							
2.	To understand the structure of executive, legislature and judiciary							
3.	To understand philosophy of fundamental rights and duties							
4.	To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.							
5.	To understand the central and state relation financial and administrative.							
<b>Course Outcomes:</b> At the end of the semester/course, the student will be able to have a clear knowledge on the following:								
1.	Understand historical background of the constitution making and its importance for building a democratic India.							
2.	Understand the functioning of three wings of the government i.e., executive, legislative and judiciary.							
3.	Understand the value of the fundamental rights and duties for becoming good citizen of India.							
4.	Analyze the decentralization of power between central, state and local self-government.							
5.	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.							
6.	<ol style="list-style-type: none"> <li>1. Know the sources, features and principles of Indian Constitution.</li> <li>2. Learn about Union Government, State government and its administration.</li> <li>3. Get acquainted with Local administration and Panchayati Raj.</li> <li>4. Be aware of basic concepts and developments of Human Rights.</li> <li>5. Gain knowledge on roles and functioning of Election Commission</li> </ol>							
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(8 Hrs)</b>	Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.							
<b>Learning Outcomes:</b> After completion of this unit student will								
<ul style="list-style-type: none"> <li>● Understand the concept of Indian constitution</li> <li>● Apply the knowledge on directive principle of state policy</li> <li>● Analyze the History, features of Indian constitution</li> <li>● Evaluate Preamble Fundamental Rights and Duties</li> </ul>								
<b>UNIT-II</b> <b>(8 Hrs)</b>	Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;							
<b>Learning Outcomes:</b> - After completion of this unit student will								
<ul style="list-style-type: none"> <li>● Understand the structure of Indian government</li> <li>● Differentiate between the state and central government</li> <li>● Explain the role of President and Prime Minister</li> <li>● Know the Structure of supreme court and High court</li> </ul>								

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<b>UNIT-III (8 Hrs)</b>	State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organisation, Structure and Functions
<b>Learning outcomes:-After completion of this unit student will</b>	
<ul style="list-style-type: none"> <li>● Understand the structure of state government</li> <li>● Analyze the role Governor and Chief Minister</li> <li>● Explain the role of state Secretariat</li> <li>● Differentiate between structure and functions of state secretariat</li> </ul>	
<b>UNIT-IV (8 Hrs)</b>	Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayati Raj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy
<b>Learning outcomes:-After completion of this unit student will</b>	
<ul style="list-style-type: none"> <li>● Understand the local Administration</li> <li>● Compare and contrast district administration role and importance</li> <li>● Analyze the role of Mayor and elected representatives of Municipalities</li> <li>● Evaluate Zilla Panchayat block level organization</li> </ul>	
<b>UNIT-V (8 Hrs)</b>	Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women
<b>Learning outcomes:-After completion of this unit student will</b>	
<ul style="list-style-type: none"> <li>● Know the role of Election Commission apply knowledge</li> <li>● Contrast and compare the role of Chief Election Commissioner and Commissionerate</li> <li>● Analyze role of state election commission</li> <li>● Evaluate various commissions of viz SC/ST/OBC and women</li> </ul>	
<b>References:</b>	
1.	Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd., New Delhi
2.	Subash Kashyap, Indian Constitution, National Book Trust
3.	J.A. Siwach, Dynamics of Indian Government & Politics
4.	D.C. Gupta, Indian Government and Politics
5.	H.M. Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6.	J.C. Johari, Indian Government and Politics Hans
7.	J. Raj Indian Government and Politics
8.	M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd., New Delhi
9.	Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012
<b>E-resources:</b>	
1.	<a href="http://nptel.ac.in/courses/109104074/8">nptel.ac.in/courses/109104074/8</a>
2.	<a href="http://nptel.ac.in/courses/109104045/">nptel.ac.in/courses/109104045/</a>
3.	<a href="http://nptel.ac.in/courses/101104065/">nptel.ac.in/courses/101104065/</a>
4.	<a href="http://www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution">www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution</a>
5.	<a href="http://www.hss.iitb.ac.in/en/lecture-details">www.hss.iitb.ac.in/en/lecture-details</a>

  
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(AUTONOMOUS)**

(Affiliated to JNTUK, Kakinada). (Recognized by AICTE, New Delhi)

Accredited by NAAC with 'A' Grade

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**ELECTRONICS & COMMUNICATION ENGINEERING**

**SCHEME OF INSTRUCTION & EXAMINATION**

(Regulation R19)

**I/IV B.TECH II-  
SEMESTER**

(With effect from **2019-2020** Admitted Batch onwards)

Subject Code	Name of the Subject	Category	Cr	L	T	P	Internal Marks	External Marks	Total Marks
B19 HS 1201	English	HS	3	3	--	--	25	75	100
B19 BS 1202	Mathematics-III	BS	3	3	--	--	25	75	100
B19 BS 1203	Applied Physics	BS	3	3	--	--	25	75	100
B19 EE 1202	Basic Electrical Engineering	ES	3	3	--	--	25	75	100
B19 ME 1201	Engineering Drawing	ES	2.5	1	--	3	25	75	100
B19 BS 1206	Applied Physics Lab	BS	1.5	--	--	3	20	30	50
B19 HS 1202	Communication Skills Lab	HS	1.5	--	--	3	20	30	50
B19 EE 1204	Basic Electrical Engineering Lab	ES	1	--	--	2	20	30	50
B19 EC 1201	Electronics Workshop practice	ES	1	--	--	2	20	30	50
B19 EC 1202	Engineering Exploration Project	PR	1	--	--	2	--	50	50
B19MC 1201	Environmental Science	MC	0	3	--	--	--	--	--
<b>TOTAL</b>			<b>20.5</b>	<b>16</b>	<b>--</b>	<b>15</b>	<b>205</b>	<b>545</b>	<b>750</b>

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19HS1201	HS	3	--	--	3	25	75	3 Hrs.

### ENGLISH

#### (Electronics & Communication Engineering)

#### Introduction:

The course is designed to train students in receptive as well as productive skills by incorporating a comprehensive, coherent and integrated approach that improves the learners' ability to effectively use English language in academic/ workplace contexts. The shift is from *learning about the language* to *using the language*. On successful completion of the compulsory English language course/s in B.Tech., learners would be confident of appearing for international language qualification/proficiency tests such as GRE, GMAT, IELTS, TOEFL and BEC besides being able to handle the writing tasks and verbal ability component of campus placement tests. Activity based teaching-learning methods would be adopted to ensure that learners would engage in actual use of language both in the classroom and laboratory sessions.

#### Course Objectives:

1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.
2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.
3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.
4. Impart effective strategies for good writing and demonstrate the same in both summarizing and analyzing; writing well-organized essays, letters, e-mails, CV's and reports.
5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.

#### Course Outcomes:

S.No	Outcome	Knowledge Level
1	Identify the context, topic and pieces of specific information by understanding and responding to the social or transactional dialogues spoken by native speakers of English.	K3
2	Apply suitable strategies for skimming and scanning to get the main idea of a text and locate specific information.	K3
3	Build confidence and adapt themselves to the social and public discourses, discussions and presentations.	K6
4	Understand and apply the principles of writing to paragraphs, arguments, essays and formal/informal communication.	K6
5	Construct sentences using proper grammatical structures and correct word forms.	K4

### SYLLABUS

<b>UNIT-I</b> (8 Hrs)	<b>Lesson: A Drawer full of happiness</b> from <i>Infotech English</i> , Maruthi Publications. <b>Listening:</b> Listening to short audio texts and identifying the topic, context and specific pieces of information to answer a series of questions both in speaking and writing.
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	<p><b>Speaking:</b> Self- introduction and introducing others. Asking and answering general questions on topics such as home, family, work, studies and interests.</p> <p><b>Reading:</b> Skimming text to get the main idea. Scanning to look for specific pieces of information.</p> <p><b>Reading for Writing:</b> Paragraph Writing (Hints Development), general essays using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing, punctuation.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20) GRE Vocabulary (20), antonyms and synonyms, word applications, verbal reasoning and sequencing of words.</p> <p><b>Grammar:</b> Content words and function words; parts of Speech, tenses, word order in sentences, sentence structures.</p> <p><b>Pronunciation:</b> Vowels, consonants, plural markers and their realizations</p>
<p><b>UNIT-II</b> <b>(8 Hrs)</b></p>	<p><b>Lesson-: Nehru's letter to his daughter, Indira on her birthday</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Answering a series of questions about main idea and supporting ideas after listening to audio texts both in speaking and writing.</p> <p><b>Speaking:</b> Discussion in pairs/ small groups on specific topics followed by short structured talks, functional English: greetings and leave takings.</p> <p><b>Reading:</b> Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.</p> <p><b>Reading for Writing:</b> Identifying the main ideas, rephrasing and summarizing them (précis writing); avoiding redundancies and repetitions.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words), antonyms and synonyms, word applications.</p> <p><b>Grammar:</b> Articles, prepositions and use of antonyms.</p> <p><b>Pronunciation:</b> Past tense markers, word stress-di-syllabic words.</p>
<p><b>UNIT-III</b> <b>(8 Hrs)</b></p>	<p><b>Lesson: Stephen Hawking-Positivity 'Benchmark'</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Listening for global comprehension and summarizing what is listened to both in speaking and writing.</p> <p><b>Speaking:</b> Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: complaining and apologizing.</p> <p><b>Reading:</b> Reading a text in detail by making basic inferences -recognizing: and interpreting specific context clues; strategies to use text clues for comprehension, critical reading.</p> <p><b>Reading for Writing:</b> Letter writing- types, format and principles of letter writing, E-mail etiquette, writing a Resume/CV and covering letter.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words). GRE. Vocabulary 20 words), antonyms and synonyms, word applications, sequencing of words.</p>

  
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	<p><b>Grammar:</b> Active and passive Voice, question Tags, direct and indirect speech, reporting for academic purposes.</p> <p><b>Pronunciation:</b> Word stress-poly-syllabic words.</p>
UNIT-IV (8 Hrs)	<p><b>Lesson: Liking a Tree, Unbowed: Wangari Maathai-biography</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Making predictions while listening to conversations/ transactional dialogues without video (only audio), listening to audio-visual texts.</p> <p><b>Speaking:</b> Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: asking for permissions, requesting, Inviting.</p> <p><b>Reading:</b> Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.</p> <p><b>Reading for Writing:</b> Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Pamphlet writing, writing for media, writing SOP's.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words GRE Vocabulary (20 words), antonyms and synonyms, word applications, cloze encounters, foreign phrases.</p> <p><b>Grammar:</b> Quantifying expressions - adjectives and adverbs: comparing and contrasting; degrees of comparison.</p> <p><b>Pronunciation:</b> Contrastive Stress.</p>
UNIT-V (8 Hrs)	<p><b>Lesson: Stay Hungry–Stay Foolish</b> from <i>Infotech English</i>, Maruthi Publications.</p> <p><b>Listening:</b> Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing.</p> <p><b>Speaking:</b> Formal oral presentations on topics from academic contexts – with/without the use of PPT slides. Functional English: Suggesting/Opinion giving.</p> <p><b>Reading:</b> Reading for comprehension, RAP Strategy - intensive reading and extensive reading techniques.</p> <p><b>Reading for Writing:</b> Report writing, writing academic proposals- writing research articles: format and style.</p> <p><b>Vocabulary:</b> Technical vocabulary from across technical branches (20 words GRE Vocabulary (20 words, antonyms and synonyms, word applications, coherence, matching emotions).</p> <p><b>Grammar:</b> Editing short texts — identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject-verb agreement).</p> <p><b>Pronunciation:</b> Stress in compound words</p>
<b>Text Books:</b>	
1.	<i>Infotech English</i> , Maruthi Publications.
<b>Reference Books:</b>	
1.	Bailey, Stephen. <i>Academic writing: A Handbook for International Students</i> . Routledge, 2014.

  
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2.	Chase. Becky Tarver. <i>Pathways: Listening, Speaking and Critical Thinking</i> . Heinley ELT; 2nd Edition, 2018.
3.	<i>Skilful Level 2 Reading &amp; Writing Student's Book Pack</i> (B1). Macmillan Educational.
4.	Hewing, Martin. <i>Cambridge Academic English (B2)</i> . CUP, 2012.
<b>Weblinks:</b>	
	<b>Grammar/Listening/Writing</b>
	1-language.com
	<a href="http://www.5minuteenglish.com/">http://www.5minuteenglish.com/</a>
	<a href="https://www.englishpractice.com/">https://www.englishpractice.com/</a>
	<b>Grammar/Vocabulary</b>
	English Language Learning Online
	<a href="http://www.bbc.co.uk/learningenglish/">http://www.bbc.co.uk/learningenglish/</a>
	<a href="http://www.better-english.com/">http://www.better-english.com/</a>
	<a href="http://www.nonstopenglish.com/">http://www.nonstopenglish.com/</a>
	<a href="https://www.vocabulary.com/">https://www.vocabulary.com/</a>
	BBC Vocabulary Games
	Free Rice Vocabulary Game
	<b>Reading</b>
	<a href="https://www.usingenglish.com/comprehension/">https://www.usingenglish.com/comprehension/</a>
	<a href="https://www.englishclub.com/reading/short-stories.htm">https://www.englishclub.com/reading/short-stories.htm</a>
	<a href="https://www.english-online.at/">https://www.english-online.at/</a>
	<b>Listening</b>
	<a href="https://learningenglish.voanews.com/z/3613">https://learningenglish.voanews.com/z/3613</a>
	<a href="http://www.englishmedialab.com/listening.html">http://www.englishmedialab.com/listening.html</a>
	<b>Speaking</b>
	<a href="https://www.talkenglish.com/">https://www.talkenglish.com/</a>
	BBC Learning English – Pronunciation tips
	Merriam-Webster – Perfect pronunciation Exercises
	<b>All Skills</b>
	<a href="https://www.englishclub.com/">https://www.englishclub.com/</a>
	<a href="http://www.world-english.org/">http://www.world-english.org/</a>
	<a href="http://learnenglish.britishcouncil.org/">http://learnenglish.britishcouncil.org/</a>
	Online Dictionaries
	Cambridge dictionary online
	MacMillan dictionary
	Oxford learner's dictionaries

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1202	BS	3	--	--	3	25	75	3 Hrs.

### MATHEMATICS-III

(Multivariable Calculus and Fourier analysis)

(Common to CE,CSE,ECE,EEE & IT)

**Prerequisites:** Concepts of Calculus

**Course Objectives:** The students are expected to learn:

1. How to expand a periodic function in a Fourier series.
2. How to find Fourier transform for a given function and evaluate some real definite integrals.
3. Evaluation of Multiple integrals; definitions of Beta, Gamma and error functions.
4. Concepts of Gradient, divergence and curl and second order operators.
5. To evaluate line integral, compute work done by a force and Flux of a vector function
6. Green's, Stokes' and Gauss divergence theorems.

#### Course Outcomes

S.No	Outcome	Knowledge Level
1.	Determine Fourier series and half range series of functions.	K2
2.	Find different Fourier transforms of non-periodic functions and also use them to evaluate integrals.	K3
3.	Use the knowledge of Beta and Gamma functions in evaluating improper integrals.	K2
4.	Evaluate double integrals, simple triple integrals & find areas and volume.	K2
5.	Find the gradient of a scalar function, divergence and curl of a vector function. Determine scalar potential.	K2
6.	Apply Green's, Stokes' and Gauss divergence theorems to solve problems.	K3

#### SYLLABUS

<b>UNIT-I</b> (10 Hrs)	<b>Fourier Series</b> Introduction, Periodic functions, Fourier series of a periodic function, Dirichlet's conditions, Even and odd functions, Change of interval, Half-range sine and cosine series.
<b>UNIT-II</b> (10 Hrs)	<b>Fourier Transforms</b> Fourier integral theorem (without proof), Complex form of Fourier integral, Fourier sine and cosine integrals, Fourier transform, Fourier sine and cosine transforms, Finite Fourier transforms, properties, inverse transforms, Parseval's Identities.
<b>UNIT-III</b> (12 Hrs)	<b>Single and Multiple integrals</b> Beta and Gamma functions, Properties, Relation between Beta and Gamma functions, Applications: evaluation of improper integrals, error function and the complimentary error function. Double and triple integrals, change of variables, Change of order of integration. Applications: Areas and volumes.

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<b>UNIT-IV (10 Hrs)</b>	<b>Vector Differentiation</b> Gradient, directional derivative, Divergence, Curl, Incompressible flow, solenoidal and irrotational vector fields, vector identities.
<b>UNIT-V (10 Hrs)</b>	<b>Vector Integration</b> Line integral, Work done, Potential function; Area, Surface and volume integrals, Flux. Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related Problems.
<b>Text Books:</b>	
1.	<b>B.S.Grewal</b> , Higher Engineering Mathematics, 43 <sup>rd</sup> Edition, Khanna Publishers.
2.	<b>N.P.Bali &amp; Manish Goyal</b> , Engineering Mathematics, Lakshmi Publications.
<b>Reference Books:</b>	
1.	<b>Michael Greenberg</b> , Advanced Engineering Mathematics, 9 <sup>th</sup> edition, Pearson edn.
2.	<b>Erwin Kreyszig</b> Advanced Engineering Mathematics, 10 <sup>th</sup> Edition, Wiley-India.
3.	<b>Peter O'Neil</b> , Advanced Engineering Mathematics, 7 <sup>th</sup> edition, Cengage Learning.
4.	<b>D.W. Jordan and T. Smith</b> , Mathematical Techniques, Oxford University Press.
5.	<b>Srimanta Pal, Subodh C. Bhunia</b> , Engineering Mathematics, Oxford University Press.
6.	<b>Dass H.K., Rajnish Verma. Er.</b> , Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, New Delhi.

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1203	BS	3	--	--	3	25	75	3 Hrs.

**APPLIED PHYSICS**  
(Common to CSE, ECE & IT)

**Course Objectives:**

1.	<b>To impart</b> the knowledge in basic concepts of wave optics through the Phenomena of interference and diffraction, basic concepts and properties of dielectric and magnetic materials and semiconductors.
2.	<b>To familiarize</b> the student with modern technologies like lasers, optical fibers and ultrasonics with an understanding of the science behind.
3.	<b>To impart</b> the elementary concepts of nanomaterials and their significance in different engineering branches.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1	<b>Interpret</b> the behavior of light radiation in interference and diffraction Phenomena and their applications.	K3
2	<b>Explain</b> the properties of dielectric and magnetic materials suitable for engineering applications.	K3
3	<b>Explain</b> the important aspects of semiconductors and electrical conductivity in them.	K3
4	<b>Understand</b> the basics of modern technologies lasers, optical fibers and ultrasonics and their utility in various fields.	K3
5	<b>Demonstrate</b> the synthesis methods and applications of nanomaterials.	K2

**SYLLABUS**

<b>UNIT-I</b> (10 Hrs)	<p><b>WAVE OPTICS</b></p> <p><b>Interference:</b> Principle of super position. Interference of light, interference in thin films (reflected light) – Wedge film and Newton’s rings – Applications</p> <p><b>Diffraction:</b> Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction grating, grating spectrum. Missing order, Resolving power, Rayleigh’s Criterion, Resolving power of Grating, Telescope, Microscope (qualitative treatment only)</p>
<b>UNIT-II</b> (10 Hrs)	<p><b>DIELECTRICS AND MAGNETICS</b></p> <p><b>Dielectrics :</b> Introduction to dielectrics, Electric Polarization, Dielectric polarizability, Susceptibility, Dielectric constant, Types of Polarization, Frequency dependence of Polarization, Internal field in a dielectric, Clausius and Mosotti equation, Applications of dielectrics.</p> <p><b>Magnetics:</b> Introduction to magnetics, Magnetic dipole moment , Magnetization, Magnetic susceptibility and Permeability, Origin of permanent magnetic moment, Classification of magnetic materials, Hysteresis – Weiss Domain theory – Ferrites, soft and hard magnetic materials, Magnetic device applications.</p>

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<b>UNIT-III (10 Hrs)</b>	<p><b>LASERS AND FIBER OPTICS</b>  <b>Lasers:</b> Introduction, Interaction of radiation with matter, condition for light amplification, Einstein's relations. Requirements of laser device Types of lasers, Design and working of Ruby and He – Ne lasers, Laser characteristics and applications.  <b>Fiber Optics:</b> Introduction to optical fibers, Principle of light propagation in fiber, Acceptance angle, Numerical aperture, Modes of propagation, types of fibers, classification of fibers based on refractive index profile, applications of fibers with emphasis on fiber optic communication.</p>
<b>UNIT-IV (9 Hrs)</b>	<p><b>SEMICONDUCTORS</b>  Introduction, intrinsic semi conductors, density of charge carriers, Fermi energy, Electrical conductivity – Extrinsic semi conductors – P-type and N-type, Density of charge carriers, dependence of Fermi energy on carrier concentration and temperature, direct and indirect band – gap semi conductors, Hall effect, Applications of Hall effect. Drift and diffusion currents, Continuity equation, applications of semi conductors.</p>
<b>UNIT-V (9 Hrs)</b>	<p><b>ULTRASONICS AND NANOMATERIALS</b>  <b>Ultrasonics:</b> Introduction, Production of Ultrasonics – Piezoelectric and Magnetostriction methods, detection of ultrasonics, acoustic grating, applications of ultrasonics.  <b>Nanomaterials:</b> Introduction, salient features of Nanomaterials, Synthesis methods – Ball milling, Condensation, Chemical vapour Deposition and Sol – Gel methods, Characterization techniques for Nano materials, Carbon nanotubes (CNTS), Applications of Nano materials.</p>
<b>Text Books:</b>	
1.	A text Book of Engineering Physics – M.N. Avadhanulu and P.G.Kshirasagar.-S.Chand Publications 2017
2.	Engineering Physics by HK Malik and A.K.Singh. McGrawhill Publishing Company Ltd.
3.	Engineering Physics by V.Rajendran. McGrawhill Education (India)Pvt Ltd.
<b>Reference Books:</b>	
1.	Introduction to Solid State Physics by Charles Kittel , Wiley Publications 2011
<b>UNIT-I (10 Hrs)</b>	<p>^ Semiconductor Devices, Physics and Technology by S.M.Sri, Wiley, Publications 2000  (reflected light) – Wedge film and Newton's rings – Applications  <b>Diffraction:</b> Types of diffraction, Fraunhofer diffraction at a single slit, Diffraction grating, grating spectrum. Missing order, Resolving power, Rayleigh's Criterion, Resolving power of Grating, Telescope, Microscope (qualitative treatment only)</p>

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19EE1202	ES	3	--	--	3	25	75	3 Hrs.

**BASIC ELECTRICAL ENGINEERING**  
**(Electronics & Communication Engineering)**

**Course Objectives:**

1. To introduce basics of electric circuits.
2. To teach DC and AC electrical circuit analysis.
3. To explain working principles of transformers and AC machines.
4. To learn the principle of operation, constructional details, performance, torque– slip characteristics of 3-phase induction motors.
5. To study the principle of operation, construction and details of special machines.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1.	Able to analyze the various Electrical networks	K4
2.	Able to explain the operation of DC generator and analyze the characteristics of DC generator.	K2
3.	Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the speed control methods of DC motors.	K4
4.	Able to explain the operation of single-phase transformer and choose correct rating of a transformer for a specific application.	K3
5.	Ability to analyze the performance and speed – torque characteristics of a 3-phase induction motor.	K4
6.	Able to explain the operation of special machines	K2

**SYLLABUS**

<b>UNIT-I</b> <b>(10 Hrs)</b>	<b>DC CIRCUITS:</b> Electrical circuit elements (R - L and C), Types of sources- Ohms Law- Kirchhoff laws –Network reduction techniques (series, parallel, series-parallel and Star-Delta Transformations), Source transformation, Mesh analysis and nodal analysis-Simple problems.
<b>UNIT-II</b> <b>(12 Hrs)</b>	<b>AC CIRCUITS:</b> Representation of sinusoidal waveforms - Peak, Average and RMS values - Phasor representation - power factor - Analysis of single-phase ac circuits consisting of pure resistor, pure inductor, pure capacitor, R-L, R-C, RLC series circuits-instantaneous power-real power - reactive power - apparent power.
<b>UNIT-III</b> <b>(10 Hrs)</b>	<b>D.C MACHINES</b> Principle of operation of DC generator – emf equation – types of DC machines – OCC of DC shunt generator - Torque equation of DC motor- characteristics - applications –losses and efficiency - Brake test - Swinburne’s test - speed control of d.c shunt motor- Simple Problems.

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<b>UNIT-IV (10 Hrs)</b>	<b>AC MACHINES:</b> Principle and operation of Single-Phase Transformer –EMF equation- Equivalent circuit-OC and SC test on transformer. Principle and operation of Induction Motor-Torque equation-Slip-Torque characteristics-Brake test on Induction motor- Simple Problems.
<b>UNIT-V (8 Hrs)</b>	<b>SPECIAL MACHINES:</b> Construction and Principle of operation of Single-phase induction motor, Stepper motor, Universal motor, BLDC motor
<b>Text Books:</b>	
1.	Engineering Circuit Analysis, William H.Hayt Jr. and Jack E. Kemmerley, 5th Edition, McGraw Hill International Edition.
2.	Electrical Machinery by Dr .P.S BIMBRA, 7 <sup>th</sup> Edition, Khanna publications
3.	Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chand publications
4.	Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria & Sons.
5.	Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
<b>Reference Books:</b>	
1.	Fundamentals of Electric circuits 5th edition Charles K. Alexander and Matthew Sadiku.
2.	Basic Electrical Engineering by Nagsarkar, Sukhija, Oxford Publications, 2 <sup>nd</sup> edition
3.	Electrical Technology by Surinder Pal Bali, Pearson Publications. January 1, 2013
<b>Web Links:</b>	
1.	<a href="https://nptel.ac.in/courses/108108076/">https://nptel.ac.in/courses/108108076/</a>
2.	<a href="https://www.pdfdrive.com/basic-electrical-engineering-books.html">https://www.pdfdrive.com/basic-electrical-engineering-books.html</a>

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19ME1201	ES	1	--	3	2.5	25	75	3 Hrs.
<b>ENGINEERING DRAWING</b>								
<b>(Common to CSE,ECE &amp; IT)</b>								
<b>Course Objectives:</b>								
1.	Bring awareness that engineering drawing is the language of engineers							
2.	To impart basic knowledge and skills required to prepare engineering drawings.							
3.	To visualize and represent the pictorial views with proper dimensioning and scaling.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Apply principles of drawing to Construct polygons and engineering curves.							K3
2.	Apply principles of drawing to draw the projections of points and lines.							K3
3.	Apply principles of drawing to draw the projections of planes							K3
4.	Apply principles of drawing to draw the projections of solids.							K3
5.	Apply principles of drawing to represent the object in 3D view through isometric views.							K3
<b>SYLLABUS</b>								
<b>UNIT-I (8 Hrs)</b>	<b>Polygons:</b> Constructing regular polygons by general methods, inscribing and describing polygons on circles. <b>Curves:</b> Parabola, Ellipse and Hyperbola by general method (eccentricity method only), cycloids, involutes, tangents & normals for the curves.							
<b>UNIT-II (8 Hrs)</b>	<b>Orthographic Projections:</b> Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to one of the reference planes(HP,VP or PP) Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT.							
<b>UNIT-III (6 Hrs)</b>	<b>Projections of planes:</b> regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.							
<b>UNIT-IV (6 Hrs)</b>	Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.							
<b>UNIT-V (8 Hrs)</b>	Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.							
<b>Text Books:</b>								
1.	Engineering Drawing by N.D. Bhatt, Chariot Publications.							
2.	Engineering Drawing by Agarwal&Agarwal, Tata McGraw Hill Publishers							

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<b>Reference Books:</b>	
1.	Engineering Drawing by K.L.Narayana& P. Kanniah, Scitech Publishers.
2.	Engineering Graphics for Degree by K.C. John, PHI Publishers.
3.	Engineering Graphics by PI Varghese, McGrawHill Publishers.
4.	Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age
<b>Web links</b>	
1.	<a href="https://nptel.ac.in/courses/112103019/">https://nptel.ac.in/courses/112103019/</a>
2.	<a href="https://nptel.ac.in/courses/112104172/1">https://nptel.ac.in/courses/112104172/1</a>

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19BS1206	BS	--	--	3	1.5	20	30	3 Hrs.
<b>APPLIED PHYSICS LAB</b>								
<b>(Common to CSE,ECE &amp; IT)</b>								
<b>Course Objectives:</b>								
1.	To impart hands-on experience to the students entering engineering / Technology education about handling sophisticated equipment / instruments.							
2.	To make the students understand the theoretical aspects of various phenomena experimentally.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Students get hands on experience in setting up experiments and using the instruments / equipment individually.							K3
2.	Get introduced to using new / advanced technologies and understand their significance.							K3
<b>LIST OF EXPERIMENTS</b>								
1.	Determination of the Wavelength of light from a source – Diffraction Grating – Normal incidence.							
2.	Determination of radius of curvature of Plano convex lens – Newton’s Rings.							
3.	Determination of the thickness of a thin spacer using interference – Air Wedge method.							
4.	Determination of Magnetic field along the axis of a current carrying coil –Stewart and Gee’s apparatus.							
5.	Verification of Laws of series and parallel combinations of resistances – Carey Foster’s bridge.							
6.	Determination of Temperature Coefficient of Resistance of a thermistor							
7.	Determination of resistivity of semiconductors by Four probe method.							
8.	Determination of dielectric Constant by charging and discharging method.							
9.	Resolving power of a grating.							
10.	Determination of the velocity of sound - Volume Resonator method.							
11.	Determination of the Rigidity modulus of elasticity of a material – Torsional pendulum.							
12.	Verification of the laws of vibrations in stretched strings -Sonometer.							
13.	Determination of Magnetic susceptibility by Quinke’s method.							
14.	Study of variation of dielectric constant with temperature.							
15.	Determination of the frequency of the AC supply – AC Sonometer.							
<b>Reference Books:</b>								
1.	Advanced Practical Physics Vol 1& 2 SP Singh & M.S ChauhanPragatiPrakashan ,Meerut							

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19HS1202	HS	--	--	3	1.5	20	30	3 Hrs.

**COMMUNICATION SKILLS LAB**  
(Common to CE,ECE,EEE & ME)

**Course Objectives:**

1. Students will be exposed to a variety of formal discussions.
2. Students will be habituated to CALL (Computer Assisted Language Learning). Thus providing them with the required facility to face computer-based competitive exams like GRE, TOEFL, GMAT etc.
3. Students will equip themselves with professional communication.
4. Students build their confidence in speaking skills.
5. Students learn and enhance LSRW Skills.

**Course Outcomes:**

S.No	Outcome	Knowledge Level
1	Learn different aspects of English language proficiency in LSRW skills.	K4
2	Apply communication skills through various language learning activities.	K3
3	Draft job application letters.	K6
4	Adopt a professional etiquette in formal settings.	K6
5	Improve fluency and clarity in both spoken and written English.	K3

**SYLLABUS**

<b>UNIT-I</b>	JAM, Common Errors Neutralizing accent
<b>UNIT-II</b>	Telephonic Etiquette, Role Plays, Poster Presentations
<b>UNIT-III</b>	Presentation Skills Public Speaking Data Interpretation
<b>UNIT-IV</b>	Group Discussion Do's and Don'ts
<b>UNIT-V</b>	Curriculum Vitae Covering Letter Interview Skills Mock Interviews, FAQ's

  
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<b>Reference Books:</b>	
1.	Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.
2.	English Pronunciation in use- Mark Hancock, CUP.
3.	English Phonetics and Phonology-Peter Roach, CUP.
4.	English Pronunciation in use- Mark Hewings, CUP.
5.	English Pronunciation Dictionary- Daniel Jones, CUP.
6.	English Phonetics for Indian Students- P. BalaSubramanian, Mac Millan Publications.
7.	Technical Communication- Meenakshi Raman, Sangeeta Sharma, OUP.
8.	Technical Communication- Gajendra Singh Chauhan, SmitaKashiramka, cengage Publications

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19EE1204	ES	--	--	2	1	20	30	3 Hrs.
<b>BASIC ELECTRICAL ENGINEERING LAB</b>								
<b>(Electronics &amp; Communication Engineering)</b>								
<b>Course Objectives:</b>								
1.	To know about basic electrical laws							
2.	To study the parameters of inductor.							
3.	To plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.							
4.	To control the speed of DC motors.							
5.	To predetermine the efficiency and regulation of transformers and assess their performance.							
6.	To study the performance of three phase induction motor							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Understand ohms law and Kirchhoff's laws							K2
2.	To determine the parameters of iron core inductor							K4
3.	Predetermine the performance of DC machines and transformers.							K4
4.	Make use of DC shunt machines for applications.							K3
5.	Evaluate the performance of 1-phase transformer.							K5
6.	Perform brake test on 3-phase induction motor.							K4
<b>LIST OF EXPERIMENTS</b>								
1.	Verification of ohms law							
2.	Verification of KCL and KVL.							
3.	Parameters of Iron core inductor.							
4.	Magnetization characteristics of D.C. Shunt generator.							
5.	Speed control of D.C. shunt motor.							
6.	Brake test on DC shunt motor.							
7.	Brake test on DC series motor.							
8.	Swinburne's test on DC machine.							
9.	Load test on DC shunt generator.							
10.	OC & SC tests on single-phase transformer.							
11.	Load test on single-phase transformer.							
12.	Brake test on three phase induction motor.							
<b>Reference Books:</b>								
1.	Engineering Circuit Analysis, William H.Hayt Jr. and Jack E. Kemmerley, 5th Edition, McGraw Hill International Edition.							
2.	Electrical Machinery by Dr .P.S BIMBRA, 7 <sup>th</sup> Edition, Khanna publications							
3.	Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chand publications							
4.	Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria & Sons.							
5.	Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications							

  
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Code	Category	L	T	P	C	I.M	E.M	Exam
B19EC1201	ES	--	--	2	1	20	30	3 Hrs.
<b>ELECTRONICS WORKSHOP PRACTICE</b>								
<b>(Electronics &amp; Communication Engineering)</b>								
<b>Course Objectives:</b>								
1.	This course gives a basic introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, and dismantling.							
2.	Fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Identify electronics components like resistors, capacitors, diodes, transistors etc. Assemble circuits on a breadboard, analyze the performance of the circuits, evaluate the results and confirm the validity of established concepts.							K2
2.	Use measuring instruments like the multimeter and equipments such as Function generator, power supply & CRO.							K2
3.	Solder and de-solder components on PCB. Understand PCB fabrication process and Fabricate PCBs .							K2
4.	Gets familiar with technical softwares & Google documentation tools							K3
5.	Gets familiar with electronics boards & PC hardware/software installation							K3
<b>LIST OF EXPERIMENTS</b>								
<b>I. Identification and Testing of Components:</b>								
a. Identify, Understand and draw the different circuit components & symbols used in Electronics labs.								
b. Resistance value using colour code.								
c. Bread-board and BNC Connectors.								
d. Study & Identification of different switches and relays.								
e. Classification of Active and Passive elements.								
<b>II. Laboratory Equipment:</b>								
a. Study of Power Supplies, DMM, Function Generator and CRO								
b. Measurement of Voltage Amplitude & Frequency								
c. Measurement of Inductance and Capacitance.								
d. Measurement of Voltage & current with Series & Parallel connections.								
<b>III. Soldering Practice:</b>								
a. Solder practice with different components available in lab								
b. A demo on PCB fabrication: (i) Artwork & printing of a simple PCB. (ii) Etching & drilling of								

  
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PCB.	
<b>IV. Introduction to Technical Softwares&amp; Documentation Tools:</b>	
<ul style="list-style-type: none"> <li>a. EDA Tools: PSPICE demo</li> <li>b. MATLAB Introduction : Demo, Signals &amp; Plotting</li> <li>c. Google Docs, Sheets, Slides and Forms for Documentation &amp; Collaboration</li> </ul>	
<b>V. Hardware Boards &amp; Personal Computer (PC) :</b>	
<ul style="list-style-type: none"> <li>a. Basics &amp; Demonstration of Arduino&amp; Raspberry Pi boards</li> <li>b. Study of PC Hardware</li> <li>c. PC Software installation (OS and Compilers)</li> </ul>	
<b>Reference Books:</b>	
1.	Lab Manual
2.	David A Bell, -Fundamentals of Electronic Devices and Circuits lab manual", 5th Edition, Oxford University Press 2008.

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19EC1202	PR	--	--	2	1	--	50	3 Hrs.
<b>ENGINEERING EXPLORATION PROJECT</b>								
<b>(Electronics &amp; Communication Engineering)</b>								
<b>Course Objectives:</b>								
1.	Build mindsets & foundations essential for designers							
2.	Learn about the Human-Centered Design methodology and understand their real-world applications							
3.	Use Design Thinking for problem solving methodology for investigating ill-defined problems.							
4.	Undergo several design challenges and work towards the final design challenge							
<b>Apply Design Thinking on the following Streams to</b>								
<b>Project Stream 1:</b> Electronics, Robotics, IOT and Sensors								
<b>Project Stream 2:</b> Computer Science and IT Applications								
<b>Project Stream 3:</b> Mechanical and Electrical tools								
<b>Project Stream 4:</b> Eco-friendly solutions for waste management, infrastructure, safety, alternative energy sources, Agriculture, Environmental science and other fields of engineering.								
<b>HOW TO PURSUE THE PROJECT WORK?</b>								
1.	The first part will be learning-based - making students to embrace the methodology by exploring all the phases of design thinking through the wallet/ bag challenge and podcasts.							
2.	The second part will be more discussion-based and will focus on building some necessary skills as designers and learning about complementary material for human-centered design.							
3.	The class will then divide into teams and they will be working with one another for about 2 – 3 weeks. These teams and design challenges will be the basis for the final project and final presentation to be presented.							
4.	The teams start with <b>Design Challenge</b> and go through all the phases more in depth from coming up with the right question to empathizing to ideating to prototyping and to testing.							
5.	Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc							
6.	At the end, Students are required to submit the final reports, and will be evaluated by the faculty.							
<b>TASKS TO BE DONE:</b>								
<b>Task 1: Everyone is a Designer</b>								
<ul style="list-style-type: none"> <li>▪ Understand class objectives &amp; harness the designer mindset</li> </ul>								
<b>Task 2: The Wallet/Bag Challenge and Podcast</b>								
<ul style="list-style-type: none"> <li>▪ Gain a quick introduction to the design thinking methodology</li> <li>▪ Go through all stages of the methodology through a simple design challenge</li> </ul>								

  
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- Podcast: Observe, Listen and Engage with the surrounding environment and identify a design challenge.

**Task 3: Teams & Problems**

- Start Design Challenge and learn about teams & problems through this
- Foster team collaboration, find inspiration from the environment and learn how to identify problems

**Task 4: Empathizing**

- Continue Design Challenge and learn empathy
- Learn techniques on how to empathize with users
- Go to the field and interview people in their environments
- Submit Activity Card

**Task 5: Ideating**

- Continue Design Challenge and learn how to brainstorm effectively
- Encourage exploration and foster spaces for brainstorming
- Submit Activity Card

**Task 6: Prototyping**

- Continue Design Challenge and learn how to create effective prototypes
- Build tangible models and use them as communication tools
- Start giving constructive feedback to classmates and teammates
- Submit Activity Card

**Task 7: Testing**

- Finish Design Challenge and iterate prototypes and ideas through user feedback
- Evolve ideas and prototypes through user feedback and constructive criticism
- Get peer feedback on individual and group performance
- Submit Activity Card

**Task 8:**

- Final Report Submission and Presentation

**Note:** The colleges may arrange for Guest Speakers from Various Design Fields: Graphic Design, Industrial Design, Architecture, Product Design, Organizational Design, etc to enrich the students with Design Thinking Concept.

**References:**

1.	Tom Kelly, <i>The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm</i> (Profile Books,2002)
2.	Tim Brown, <i>Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation</i> (HarperBusiness, 2009)
3.	Jeanne Liedtka, Randy Salzman, and Daisy Azer, <i>Design Thinking for the Greater Good: Innovation in the Social Sector</i> (Columbia Business School Publishing,2017)

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**OTHER USEFUL DESIGN THINKING FRAMEWORKS AND METHODOLOGIES:**

Human-Centered Design Toolkit (IDEO);<https://www.ideo.com/post/design-kit>

Design Thinking Boot Camp Bootleg (Stanford D-School);  
<https://dschool.stanford.edu/resources/the-bootcamp-bootleg>

Collective Action Toolkit  
(frogdesign);[https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT\\_2.0\\_English.pdf](https://www.frogdesign.com/wpcontent/uploads/2016/03/CAT_2.0_English.pdf)  
Design Thinking for Educators (IDEO);<https://designthinkingforeducators.com/>

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Code	Category	L	T	P	C	I.M	E.M	Exam
B19MC1201	MC	3	--	--	--	--	--	--
<b>ENVIRONMENTAL SCIENCE</b>								
<b>(Common to CE,ECE &amp; EEE)</b>								
<b>Course Objectives:</b> The objectives of the course are to impart:								
1.	Overall understanding of the natural resources.							
2.	Basic understanding of the ecosystem and its diversity.							
3.	Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.							
4.	An understanding of the environmental impact of developmental activities.							
5.	Awareness on the social issues, environmental legislation and global treaties.							
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(8 Hrs)</b>	<p><b>Multidisciplinary nature of Environmental Studies:</b> Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects;. Role of information technology in environment and human health.</p> <p><b>Ecosystems:</b> Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.</p>							
<b>UNIT-II</b> <b>(8 Hrs)</b>	<p><b>Natural Resources: Natural resources and associated problems.</b></p> <p>Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.</p> <p>Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.</p> <p>Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.</p> <p><b>Food resources:</b> World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.</p> <p>Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.</p> <p>Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.</p>							

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<b>UNIT-III (8 Hrs)</b>	<b>Biodiversity and its conservation:</b> Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.
<b>UNIT-IV (8 Hrs)</b>	<b>Environmental Pollution:</b> Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being. <b>Solid Waste Management:</b> Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.
<b>UNIT-V (8 Hrs)</b>	<b>Social Issues and the Environment:</b> Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation.-Public awareness.
<b>UNIT-VI (8 Hrs)</b>	<b>Environmental Management:</b> Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and Greenpolitics. <b>The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.</b>
<b>Text Books:</b>	
1.	Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada Rani; Pearson Education, Chennai
2.	Environmental Studies, R. Rajagopalan, 2 <sup>nd</sup> Edition, 2011, Oxford University Press.
3.	Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula
<b>Reference Books:</b>	
1.	Text Book of Environmental Studies, Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2.	A Textbook of Environmental Studies, Shaashi Chawla, TMH, New Delhi
3.	Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi
4.	Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, New Age International Publishers, 2014

## M.TECH- I-SEMESTER

Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS1101	PC	3	0	0	3	25	75	3 Hrs.
<b>DIGITAL DATA COMMUNICATIONS</b>								

  
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<b>Course Objectives:</b> The main objectives of this subject are:		
1	Different modulation techniques to improve the bandwidth and their properties.	
2	Networking and different protocol systems.	
3	Error estimation and correction, asynchronous and synchronous protocols.	
4	Multiplexing techniques, different networking connections and interfacing devices.	
5	Multiple access techniques and analysis.	
<b>Course Outcomes</b>		
S.No	At the end of this course the student will be able to:	Knowledge Level
1	Model digital communication system using appropriate mathematical techniques (error probability, constellation diagrams, phasor diagrams).	K3
2	Understanding the basic concepts of how digital data is transferred across computer networks.	K2
3	Independently understand basic computer network technology.	K2
4	Understand and explain Data Communications System and its components.	K2
5	Identify the different types of network topologies and protocols.	K3
6	Enumerate the layers of the OSI model and TCP/IP. Explain the function(s) of each layer.	K2
7	Identify the different types of network devices and their functions within a network	K3
8	Understand and building the skills of sub netting and routing mechanisms.	K3
9	Familiarity with the basic protocols of computer networks, and how they can be used	K2
10	To assist in network design and implementation.	K6
<b>SYLLABUS</b>		
<b>UNIT-I (10 Hrs)</b>	<b>Digital Modulation Schemes:</b> BPSK, QPSK, 8PSK, 16PSK, 8QAM, 16QAM, DPSK – Methods, Bandwidth Efficiency, Carrier Recovery, Clock Recovery.	
<b>UNIT-II (10 Hrs.)</b>	<b>Basic Concepts of Data Communications, Interfaces and Modems:</b> Data Communication Networks, Protocols and Standards, UART, USB, Line Configuration, Topology, Transmission Modes, Digital Data Transmission, DTE-DCE interface, Categories of Networks – TCP/IP Protocol suite and Comparison with OSI model.	
<b>UNIT-III (8Hrs.)</b>	<b>Error Correction:</b> Types of Errors, Vertical Redundancy Check (VRC), LRC, CRC, Checksum, Error Correction using Hamming code <b>Data Link Control:</b> Line Discipline, Flow Control, Error Control <b>Data Link Protocols:</b> Asynchronous Protocols, Synchronous Protocols, Character Oriented Protocols, Bit-Oriented Protocol, Link Access Procedures.	

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<b>UNIT-IV (10 Hrs.)</b>	<p><b>Multiplexing:</b> Frequency Division Multiplexing (FDM), Time Division Multiplexing (TDM), Multiplexing Application, and DSL.</p> <p><b>Local Area Networks:</b> Ethernet, Other Ether Networks, Token Bus, Token Ring, FDDI.</p> <p><b>Metropolitan Area Networks:</b> IEEE 802.6, SMDS</p> <p><b>Switching:</b> Circuit Switching, Packet Switching, Message Switching.</p> <p><b>Networking and Interfacing Devices:</b> Repeaters, Bridges, Routers, Gateway, Other Devices.</p>
<b>UNIT-V (10Hrs.)</b>	<p><b>Multiple Access Techniques:</b> Frequency- Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA), OFDM and OFDMA. Random Access, Aloha-Carrier Sense Multiple Access (CSMA)- Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation- Polling- Token Passing, Channelization.</p>
<b>Text Books:</b>	
1.	Data Communication and Computer Networking - B. A.Forouzan, 2 <sup>nd</sup> Ed., 2003, TMH.
2.	Advanced Electronic Communication Systems - W. Tomasi, 5 <sup>th</sup> Ed., 2008, PEI.
<b>Reference Book:</b>	
1.	Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2.	Data and Computer Communications - William Stallings, 8th Ed., 2007, PHI.
3.	Data Communication and Teleprocessing Systems -T. Housely, 2nd Ed, 2008, BSP.
4.	Data Communications and Computer Networks- Brijendra Singh, 2nd Ed., 2005, PHI.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS1102	PC	3	0	0	3	25	75	3 Hrs.

### ADVANCED DIGITAL SIGNAL PROCESSING

#### Course Objectives:

1	To introduce design and implementation techniques of digital filter (both FIR & IIR).
2	To introduce the concept of sampling rate conversion, different forms of filter implementation for sampling rate conversion and multistage implementation of sampling rate conversion.
3	To introduce the applications of sampling rate conversion techniques.
4	To introduce the concepts of linear prediction and solution of normal equations.
5	To introduce the Adaptive filter concepts and non-parametric methods of power spectrum estimation.
6	To introduce wavelets and applications of DSP.

#### Course Outcomes:

S.No	Outcome	Knowledge Level
1	Design and implement the digital filters (both FIR & IIR).	K6
2	Describe sampling rate conversion and multirate signal processing in the digital domain.	K1
3	Apply the concepts of sampling rate conversion in the implementation of digital filter banks, quadrature mirror filters and their use in sub band coding.	K3
4	To understand the theory of forward-backward linear prediction filters and solution of normal equations.	K2
5	Understand Adaptive filtering and the concepts of nonparametric methods of power spectrum estimation.	K2
6	To know the applications based on DSP and multirate DSP.	K3

### SYLLABUS

<b>UNIT-I</b> (10 Hrs)	<b>Review of DFT, FFT, IIR Filters and FIR Filters:</b> <b>Multirate Signal Processing:</b> Introduction, Decimation by a factor D, Interpolation by factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion.
<b>UNIT-II</b> (10 Hrs)	<b>Applications of Multirate Signal Processing:</b> Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Sub-band Coding of Speech Signals, Quadrature Mirror Filters, Trans-multiplexers, Oversampling A/D and D/A Conversion
<b>UNIT-III</b> (10 Hrs)	<b>Non-Parametric Methods of Power Spectral Estimation:</b> Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods.

  
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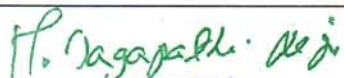


<b>UNIT-IV (8Hrs)</b>	<b>Implementation of Digital Filters:</b> Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.
<b>UNIT-V (10Hrs)</b>	<b>Parametric Methods of Power Spectrum Estimation:</b> Autocorrelation & Its Properties, Relation between autocorrelation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.
<b>Text Books:</b>	
1.	Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis, D. G. Manolakis, 4th Ed., PHI.
2.	Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
3.	DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education.
<b>Reference Books:</b>	
1.	Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2.	Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3.	Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH
4.	Digital Spectral Analysis – Jr. Marple

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS1103	PE	3	0	0	3	25	75	3 Hrs.
<b>RADAR SIGNAL PROCESSING</b>								
<b>(Program Elective-1)</b>								
<b>Course Objectives:</b>								
1	Derivation of Radar range and Design of matched filter for different noises.							
2	Signal detection techniques at receiver.							
3	Optimum Radar Waveforms for Detection of signals in Clutter and various Families.							
4	The characteristics of a Linear pulse and digital compression to Radar signals.							
5	The principles of different phase coding techniques and analysis.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Understand the operation of Radar and characteristics of Matched filter for non-white noise.							K2
2	Understand the various detection criterion and types of detectors that can be used to detect the Radar signals in noise.							K2
3	Understand the waveform design requirements and optimum waveforms for the detection of signals in clutter.							K2
4	Know the significance and types of pulse compression techniques for analog and digital signals.							K1
5	Understand the requirements of phase coding in Radar and various Polyphase codes used for phase coding.							K2
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs.)</b>	<b>Introduction:</b> Radar Block Diagram, Bistatic Radar, Monostatic Radar, Radar Equation, Information Available from Radar Echo. Review of Radar Range Performance– General Radar Range Equation, Radar Detection with Noise Jamming, Beacon and Repeater Equations, MTI and Pulse Doppler Radar. Matched Filter Receiver – Impulse Response, Frequency Response Characteristic and its Derivation, Matched Filter and Correlation Function, Correlation Detection and Cross-Correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter for Non-White Noise.							
	<b>Detection of Radar Signals in Noise:</b> Detection Criteria – Neyman-Pearson Observer, Likelihood-Ratio Receiver, Inverse Probability Receiver, Sequential Observer, Detectors–Envelope Detector, Logarithmic Detector, I/Q Detector. Automatic Detection-CFAR Receiver, Cell Averaging CFAR Receiver, CFAR Loss, CFAR Uses in Radar. Radar Signal Management–Schematics, Component Parts, Resources and Constraints							

  
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<b>UNIT-III</b> <b>(10 Hrs.)</b>	<b>Waveform Selection:</b> Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse, Noise Like Waveforms, Waveform Design Requirements, Optimum Waveforms for Detection in Clutter, Family of Radar Waveforms.
<b>UNIT-IV</b> <b>(10 Hrs.)</b>	<b>Pulse Compression in Radar Signals:</b> Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms – Block Schematic and Characteristics of Passive System, Digital Compression, SAW Pulse Compression.
<b>UNIT-V</b> <b>(8 Hrs.)</b>	<b>Phase Coding Techniques:</b> Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar. Polyphase Codes : Frank Codes, Costas Codes, Non-Linear FM Pulse Compression, Doppler Tolerant PC Waveforms – Short Pulse, Linear Period Modulation (LPM/HFM), Side lobe Reduction for Phase Coded PC Signals.
<b>Text Books:</b>	
1.	Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.
2.	Radar Design Principles: Signal Processing and the Environment - Fred E. Nathanson, 2nd Ed., 1999, PHI.
3.	Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.
<b>Reference Books:</b>	
1.	Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.
2.	Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1104	PE	3	0	0	3	25	75	3 Hrs.
<b>RF CIRCUIT DESIGN</b>								
<b>(Program Elective-1)</b>								
<b>Course Objectives:</b>								
1	To design and analyse single and multiport networks and RF Filters.							
2	To study the operation and device characteristics of RF Active components.							
3	To design and analyse RF transistor amplifier.							
4	To study the operation of Oscillators and mixers used in RF design							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Understand the behaviour of RF passive components and model active components.							K2
2	Perform transmission linear analysis.							K4
3	Demonstrate use of Smith Chart for high frequency circuit design.							K2
4	Justify the choice/selection of components from the design aspects.							K5
5	Contribute in the areas of RF circuit design.							K6
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs.)</b>	<b>Introduction to RF Electronics:</b> The Electromagnetic Spectrum, units and Physical Constants, Microwave bands – RF behaviour of Passive components: Tuned resonant circuits, Vectors, Inductors and Capacitors - Voltage and Current in capacitor circuits – Tuned RF / IF Transformers.							
<b>UNIT-II</b> <b>(10 Hrs.)</b>	<b>Transmission Line Analysis:</b> Examples of transmission lines- Transmission line equations and Biasing- Micro Strip Transmission Lines- Special Termination Conditions- sourced and Loaded Transmission Lines. <b>Single And Multiport Networks:</b> The Smith Chart, Interconnectivity networks, Network properties and Applications, Scattering Parameters.							
<b>UNIT-III</b> <b>(10 Hrs.)</b>	<b>Matching and Biasing Networks:</b> Impedance matching using discrete components – Micro strip line matching networks, Amplifier classes of Operation and Biasing networks. <b>RF Passive &amp; Active Components:</b> Filter Basics – Lumped filter design – Distributed Filter Design – Diplexer Filters- Crystal and Saw filters- Active Filters - Tunable filters – Power Combiners / Dividers – Directional Couplers – Hybrid Couplers – Isolators. RF Diodes – BJTs- FETs- HEMTs and Models.							
<b>UNIT-IV</b> <b>(10 Hrs.)</b>	<b>RF Transistor Amplifier Design:</b> Characteristics of Amplifiers - Amplifier Circuit Configurations, Amplifier Matching Basics, Distortion and noise products, Stability Considerations, Small Signal amplifier design, Power amplifier design, MMIC amplifiers, Broadband High Power multistage amplifiers, Low noise amplifiers, VGA Amplifiers.							
<b>UNIT-V</b> <b>(8 Hrs.)</b>	<b>Oscillators:</b> Oscillator basics, Low phase noise oscillator design, High frequency Oscillator configuration, LC Oscillators, VCOs, Crystal Oscillators, PLL Synthesizer, and Direct Digital Synthesizer. <b>RF Mixers:</b> Basic characteristics of a mixer - Active mixers- Image Reject and Harmonic mixers, Frequency domain considerations.							

  
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<b>Text Books:</b>	
1.	RF Circuit design: Theory and applications by Reinhold Ludwig, PavelBretchko. Pearson Education Asia Publication, New Delhi 2001.
2.	Radio Frequency and Microwave Communication Circuits – Analysis and Design – Devendra K. Misra, Wiley Student Edition, John Wiley & Sons
<b>Reference Books:</b>	
1.	Radio frequency and Microwave Electronics - Mathew M.Radmangh, 2001, PE Asia Publ.
2.	RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3.	Secrets of RF Design - Joseph Carr., 3 <sup>rd</sup> Edition, Tab Electronics.
4.	Complete Wireless Design - Cotter W. Sawyer, 2 <sup>nd</sup> Edition, Mc-Graw Hill.
5.	Practical RF Circuit Design for Modern Wireless Systems Vol.2 -Less Besser and Rowan Gilmore.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1105	PE	3	0	0	3	25	75	3 Hrs.

**ADVANCED COMPUTER NETWORKS**  
(Program Elective-1)

**Course Objectives:**

1.	The aim of this course is to introduce key concepts and principles of computer networks and Congestion and Quality of Service.
2.	Illustrate reference models with layers, protocols and interfaces.
3.	Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
4.	Have the knowledge on Interconnection Networks, Look into the widely used networks like SONET/SDH and describe how routing protocols work.
5.	To know the basic concepts of Spread Spectrum, Discuss Ipv6 addresses. Compare Ipv4 and Ipv6 addresses and look into the transition from Ipv4 to Ipv6.
6.	To have knowledge on IEEE802.11, and to know the basic cellular concepts and describe the features and functions of multiplexing and modulation.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1	Able to Define Congestion and Quality of Service and Illustrate reference models with layers, protocols and interfaces.	K1
2	Familiar with the basic protocols of computer networks, and how they can be used to assist in network design and implementation	K2
3	Understand the general principles behind , addressing, routing, reliable transmission and other stateful protocols	K2
4	Have an informed view of both the internal workings of the Internet and of a number of common Internet applications and protocols	K1
5	Familiar with the basic cellular concepts and understand the importance of multiple accessing schemes.	K2

**SYLLABUS**

<b>UNIT-I</b> (10 Hrs)	<b>Congestion and Quality of Service (QoS):</b> Data traffic, Congestion, Congestion Control, Two examples, Quality of Service, Techniques to improve QOS, Integrated Services and Differential services. <b>Queue Management:</b> Passive-Drop trial, Drop front, Random drop, Active- early Random drop, Random Early detection.
<b>UNIT-II</b> (10 Hrs)	<b>X.25 Standards:</b> X.25 Layers, X.21 Protocol , <b>Frame Relay:</b> Introduction, Frame relay operation, Frame relay layers, Congestion control, Leaky Bucket algorithms, <b>ATM:</b> Design goals, ATM architecture, Switching, Switch Fabric, ATM layers, Service classes, ATM applications
<b>UNIT-III</b> (10 Hrs)	<b>Interconnection Networks:</b> Introduction, Banyan Networks, Properties, Crossbar switch, Three Stage Class networks, Rearrange able Networks, Folding algorithm, Benes Networks, Lopping algorithm, Bit allocation algorithm. <b>SONET/SDH:</b> Synchronous Transport signals, Physical configuration, SONET layers, SONET Frame.

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<b>UNIT-IV</b> <b>(8Hrs)</b>	<b>Spread Spectrum:</b> Introduction, Basic concept, Protection against Jamming, Spreading codes(PN sequence), Generation, Properties, Types of Spread Spectrum Modulation, Application of Spread Spectrum. <b>Private Networks:</b> Virtual Private Networks, Network Address Translation <b>Next Generation:</b> IPV6 Transition from IPV4 to IPV6, <b>Mobile IP:</b> Addressing, Agents, Three phases, Inefficiency in Mobile IP.
<b>UNIT-V</b> <b>(10Hrs)</b>	<b>Wireless Networks: Wireless LAN:</b> IEEE802.11, Architecture, MAC Sub Layer, Addressing Mechanism, Physical Layer. <b>Bluetooth:</b> Architecture, Bluetooth layers, Radio layer, Base band layer, L2CAP, <b>Wireless WAN:</b> The Cellular Concept, Cell, Frequency reuse, Principle, Channel Assignment Strategies, Interference and system capacity, Types of interference, Improving capacity in cellular system, Handoff, AMPS, D-AMPS, GSM, CDMA, GPRS, 3G & 4G technologies.
<b>Text Books:</b>	
1.	Data Communication and Networking - B. A.Forouzan, 4 <sup>th</sup> Ed,TMH
2.	TCP/IP Protocol Suite – B. A. Forouzen, 4 <sup>th</sup> Ed, TMH
<b>Reference Books:</b>	
1.	Wireless Communication System- AbhishekYadav, University Sciences Press
2.	Wireless Digital Communications – KamiloFeher, 1999, PHI
3.	High Performance TCP-IP Networking- Mahaboob Hassan, Jain Raj, PHI
4.	ATM Fundamentals- N. N. Biswas, Adventure Book Publishers, 1998
5.	Wireless Communication – T. L. Singhal, McGraw Hill, 2010
6.	Wireless Communication and Networking- Vijay K. Garg, Elsevier, 2009

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1106	PC	3	0	0	3	25	75	3 Hrs.

### WIRELESS LANs AND PANs

#### (Program Elective-2)

#### Course Objectives:

1. To study the different generations of mobile networks.
2. To understand the concepts of Wireless LANS.
3. To understand the wireless networking IEEE 802.11 for WLAN.
4. To understand concepts of different wireless personal area networks
5. To study different working group of IEEE 802.15 standards for WLAN.

#### Course Outcomes

S.No	Outcome	Knowledge Level
1	Able to study the different generations of mobile networks.	K1
2	Able to understand the concepts of Wireless LANS.	K2
3	Able to understand the wireless networking IEEE 802.11 for WLAN.	K2
4	Able to understand the concepts of different wireless personal area networks	K2
5	Able to study different working group of IEEE 802.15 standards for WLAN.	K4

### SYLLABUS

<b>UNIT-I</b> (10 Hrs.)	<b>Wireless System &amp; Random Access Protocols:</b> Introduction, First and Second Generation Cellular Systems, Cellular Communications from 1G to 3G, Wireless 4G systems, The Wireless Spectrum; Random Methods: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).
<b>UNIT-II</b> (10 Hrs.)	<b>Wireless LANs:</b> Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology.
<b>UNIT-III</b> (10 Hrs.)	<b>The IEEE 802.11 Standard for Wireless LANs:</b> Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance, Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol.
<b>UNIT-IV</b> (10 Hrs.)	<b>Wireless PANs:</b> Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master Slave Switch; Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Pico net scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatter net formation.

  
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<b>UNIT-V (8 Hrs.)</b>	<b>The IEEE 802.15 Working Group for WPANs:</b> The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband
<b>Text Books:</b>	
1.	Ad Hoc and Sensor Networks - Carlos de MoraisCordeiro and Dharma Prakash Agrawal, World Scientific, 2011.
2.	Wireless Communications and Networking - Vijay K.Garg, Morgan Kaufmann Publishers, 2009.
<b>Reference Books:</b>	
1.	Wireless Networks - KavehPahlaram, Prashant Krishnamurthy, PHI, 2002.
2.	Wireless Communication- Marks Ciampor, JeorgeOlenewa, Cengage Learning, 2007.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1107	PE	3	0	0	3	25	75	3 Hrs.
<b>MOBILE COMPUTING TECHNOLOGIES</b>								
<b>(Program Elective-2)</b>								
<b>Course Objectives:</b>								
1.	To acquire Knowledge of WAP, Wireless Lan							
2.	To study client programming and different OS architectures.							
3.	To learn J2ME technology and Mobile VoIP							
4.	To become familiar with Security issues in Mobile Computing							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Apply advanced data communication methods and networking protocols for wireless and mobile environments							K3
2	Utilize and employ application frameworks for developing mobile applications including under disconnected and weakly connected environment							K3
3	Create web sites suitable for mobile environments							K6
4	Select components and networks for particular application							K3
5	Creatively analyse mobile and wireless networks							K4
6	Critically analyse security issues of mobile and wireless computing systems							K4
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs)</b>	<b>Introduction to Mobile Computing Architecture:</b> Mobile Computing – Dialog Control – Networks – Middleware and Gateways – Application and Services – Developing Mobile Computing Applications – Security in Mobile Computing – Architecture for Mobile Computing – Three Tier Architecture – Design considerations for Mobile Computing – Mobile Computing through Internet – Making existing Applications Mobile Enabled.							
<b>UNIT-II</b> <b>(10 Hrs)</b>	<b>Cellular Technologies: GSM, GPS, GPRS, CDMA and 3G:</b> Bluetooth – Radio Frequency Identification – Wireless Broadband – Mobile IP – Internet Protocol Version 6 (IPv6) – Java Card – GSM Architecture – GSM Entities – Call Routing in GSM – PLMN Interfaces – GSM addresses and Identifiers – Network aspects in GSM – Authentication and Security – Mobile computing over SMS – GPRS and Packet Data Network – GPRS Network Architecture – GPRS Network Operations – Data Services in GPRS – Applications for GPRS – Limitations of GPRS – Spread Spectrum technology – IS-95 – CDMA Versus GSM – Wireless Data – Third Generation Networks – Applications on 3G							
<b>UNIT-III</b> <b>(10 Hrs)</b>	<b>Wireless Application Protocol (WAP) and Wireless LAN:</b> WAP – MMS – Wireless LAN Advantages – IEEE 802.11 Standards – Wireless LAN Architecture – Mobility in wireless LAN <b>Intelligent Networks and Interworking:</b> Introduction – Fundamentals of Call processing – Intelligence in the Networks – SS#7 Signalling – IN Conceptual Model (INCM) – soft switch – Programmable Networks – Technologies and Interfaces for IN							

  
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<b>UNIT-IV</b> <b>(8Hrs)</b>	<b>Client Programming, Palm OS, Symbian OS, Win CE Architecture:</b> Introduction – Moving beyond the Desktop – A Peek under the Hood: Hardware Overview – Mobile phones – PDA – Design Constraints in Applications for Handheld Devices – Palm OS architecture – Application Development – Multimedia – Symbian OS Architecture – Applications for Symbian, Different flavors of Windows CE -Windows CE Architecture. <b>J2ME:</b> JAVA in the Handset – The Three-prong approach to JAVA Everywhere – JAVA 2 Micro Edition (J2ME) technology – Programming for CLDC – GUI in MIDP – UI Design Issues – Multimedia – Record Management System – Communication in MIDP – Security considerations in MIDP – Optional Packages
<b>UNIT-V</b> <b>(10Hrs)</b>	<b>Voice Over Internet Protocol and Convergence:</b> Voice over IP- H.323 Framework for Voice over IP – Session Initiation Protocol – Comparison between H.323 and SIP – Real Time protocols – Convergence Technologies – Call Routing – Voice over IP Applications – IP multimedia subsystem (IMS) – Mobile VoIP <b>Security Issues in Mobile Computing:</b> Introduction – Information Security – Security Techniques and Algorithms – Security Protocols– Public Key Infrastructure – Trust – Security Models – Security frameworks for Mobile Environment
<b>Text Books:</b>	
1.	Mobile Computing – Technology, Applications and Service Creation – Asoke K Talukder, Roopa R Yavagal, 2009, TATA McGraw Hill
2.	Mobile Communications – Jochen Schiller – 2 <sup>nd</sup> Edition – Pearson Education
<b>Reference Books:</b>	
1.	The CDMA 2000 System for Mobile Communications – VieriVaughni, Alexander Damn Jaonvic – Pearson
2.	Adalestein - Fundamentals of Mobile & Pervasive Computing, 2008, TMH

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Code	Category	L	T	P	C	LM	E.M	Exam
M19 CS 1108	PE	3	0	0	3	25	75	3 Hrs.

**NETWORK SECURITY & CRYPTOGRAPHY**  
(Program Elective-2)

**Course Objectives:**

- To give a clear insight into cryptography, authentication and emerging security standards.
- To impart knowledge on network security protocols.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1	Identify and utilize different forms of cryptography techniques.	K3
2	Incorporate authentication and security in the network applications.	K6
3	Distinguish among different types of threats to the system and handle the same.	K4
4	To become familiar with Security issues in Electronic transaction.	K2

**SYLLABUS**

<b>UNIT-I</b> (10 Hrs)	<p><b>Introduction:</b> Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security. Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.</p> <p><b>Modern Techniques:</b> Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles and Modes of operations.</p>
<b>UNIT-II</b> (10 Hrs)	<p><b>Encryption Algorithms:</b> Triple DES, International Data Encryption algorithm, Blowfish, RC5, CAST-128, RC2, Characteristics of Advanced Symmetric block ciphers. <b>Conventional Encryption</b> :Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.</p>
<b>UNIT-III</b> (10 Hrs)	<p><b>Public Key Cryptography:</b> Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. <b>Number Theory:</b> Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.</p>
<b>UNIT-IV</b> (10 Hrs)	<p><b>Message Authentication and Hash Functions:</b> Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.</p> <p><b>Hash and Mac Algorithms:</b> MD File, Message digest Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC. Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.</p> <p><b>Authentication Applications:</b> Kerberos, X.509 directory Authentication service. Electronic Mail Security: Pretty Good Privacy, S/MIME.</p>

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<b>UNIT-V (8 Hrs)</b>	<p><b>IP Security:</b> Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.</p> <p><b>Intruders, Viruses and Worms:</b>Intruders, Viruses and Related threats.</p> <p><b>Fire Walls:</b> Firewall Design Principles, Trusted systems.</p>
<b>Text Books:</b>	
1.	Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2.	Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
<b>Reference Books:</b>	
1.	Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2.	Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3.	Principles of Information Security, Whitman, Thomson.
4.	Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5.	Introduction to Cryptography, Buchmann, Springer.

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Code	Category	L	T	P	C	LM	E.M	Exam
M19RD1101	RD	2	0	0	2	25	75	3 Hrs.
<b>RESEARCH METHODOLOGY AND IPR</b> (Common to CST,CS,PSA, IT & CAD)								
<b>Course Objectives:</b>								
1.	To bring awareness on Research Methodology and research ethics.							
2.	Familiarize the concepts of IPR.							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Analyze research related information							K4
2.	Formulate a Research Proposals and Publish papers with research ethics							K6
3.	Award for Intellectual Property Rights like Patents, Trade and Copyrights							K5
4.	Analyze Various Intellectual Property Rights							K4
5.	Assess New Developments of IPRs in National and International level							K5
<b>SYLLABUS</b>								
<b>UNIT-I</b> (6 Hrs)	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations							
<b>UNIT-II</b> (6 Hrs)	Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee							
<b>UNIT-III</b> (6 Hrs)	Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.							
<b>UNIT-IV</b> (4 Hrs)	Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.							
<b>UNIT-V</b> (6 Hrs)	New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.							
<b>Text Books:</b>								
1.	Stuart Melville and Wayne Goddard, —Research methodology: an introduction for science & engineering students'l							
2.	Wayne Goddard and Stuart Melville, —Research Methodology: An Introductionll							
3.	Ranjit Kumar, 2nd Edition, —Research Methodology: A Step by Step Guide for beginnersl							
<b>Reference Books:</b>								
1.	Halbert, —Resisting Intellectual Propertyl, Taylor & Francis Ltd, 2007.							
2.	Mayall, —Industrial Designl, McGraw Hill, 1992.							
3.	Niebel, —Product Designl, McGraw Hill, 1974.							

  
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4.	Asimov, —Introduction to Designl, Prentice Hall, 1962.
5.	Robert P. Merges, Peter S. Menell, Mark A. Lemley, — Intellectual Property in New Technological Age, 2016.
6.	T. Ramappa, —Intellectual Property Rights Under WTOI, S. Chand, 2008

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1109	PC	0	0	4	2	25	75	3 Hrs.
<b>DATA COMMUNICATIONS LAB</b>								
<b>Course Objectives:</b>								
1.	To study the analog & digital link set up using a fiber in detail							
2.	Understand the pc-to-pc communication using parallel port							
3.	To study of LAN using star topology, bus topology and tree topology and configure modem of a computer							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1.	Students can identify the type of fibre optical cable and test their applications							K3
2.	Understand the fundamental concepts of data communications and networking							K2
3.	Identify different components and their respective roles in a computer communication system.							K3
4.	Acquaint them-selves with networking simulation tools, configuring of networking devices and understand their functionality.							K2
<b>List of Experiments</b>								
1.	Study of serial interface RS – 232							
2.	Study of pc to pc communication using parallel port							
3.	To establish pc-pc communication using LAN							
4.	Study of LAN using star topology, bus topology and tree topology							
5.	Study and configure modem of a computer							
6.	To configure a hub/switch							
7.	To study the interconnections of cables for data communication							
8.	Study of a wireless communication system							
9.	Set up of time division multiplexing using fiber optics							
10.	Digital Fibre Optical Transmitter and Receiver							
<b>Reference Books:</b>								
1.	Optical Fibre Communications – Gerd Keiser, 3 <sup>rd</sup> Ed., 2000, McGraw Hill.							
2.	Optical Fibre Communications: Principles and Practice – John.M.Senior, 2 <sup>nd</sup> Ed., 2000, PE.							
3.	Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.							
4.	Data and Computer Communications - William Stallings, 8 <sup>th</sup> Ed., 2007, PHI.							

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1110	PC	0	0	4	2	25	75	3 Hrs.

### ADVANCED DIGITAL SIGNAL PROCESSING LAB

#### Course Objectives:

1. To design different filters in software
2. To apply transforms in time and frequency
3. To perform decimation and interpolation

#### Course Outcomes

S.No	Outcome	Knowledge Level
1	Design different digital filters in software	K6
2	Apply various transforms in time and frequency	K3
3	Perform decimation and interpolation	K6

### LIST OF EXPERIMENTS

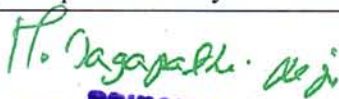
1. Basic Signal Representation
2. Correlation Auto And Cross
3. Stability Using Hurwitz Routh Criteria
4. Sampling FFT Of Input Sequence
5. Butterworth Low pass And High pass Filter Design
6. Chebychev Type I,II Filter
7. State Space Matrix from Differential Equation
8. Normal Equation Using Levinson Durbin
9. Decimation And Interpolation Using Rational Factors
10. Maximally Decimated Analysis DFT Filter
11. Cascade Digital IIR Filter Realization
12. Convolution And M Fold Decimation & PSD Estimator
13. Estimation Of PSD
14. Inverse Z Transform
15. Group Delay Calculation
16. Separation of T/F
17. Parallel Realization of IIR filter

#### Text Books:

1. Discrete Time Signal Processing - Alan V Oppenheim & R. W Schaffer, PHI.
2. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education

#### Reference Books:

1. Modern Spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000, TMH
4. Digital Spectral Analysis – Jr. Marple

  
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Code	Category	L	T	P	C	LM	E.M	Exam
M19AC0001	AC	2	0	0	0	0	0	--

### ENGLISH FOR RESEARCH PAPER WRITING

#### Course Objectives:

1. Understand how to improve your writing skills and level of readability
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title.
4. Ensure the good quality of paper at very first-time submission

#### Course Outcomes

S.No	Outcome	Knowledge Level
1.	Understand that how to improve your writing skills and level of readability	K2
2.	Learn about what to write in each section	K2
3.	Understand the skills needed when writing a Title Ensure the good quality of paper at very first time submission	K2

### SYLLABUS

<b>UNIT-I (4Hrs)</b>	Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness
<b>UNIT-II (4Hrs)</b>	Clarifying Who Did What, Highlighting Your Findings, Hedging And Criticizing, Paraphrasing and Plagiarism, Sections of a Paper.
<b>UNIT-III (4Hrs)</b>	Abstracts, Introduction, Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.
<b>UNIT-IV (4Hrs)</b>	Key skills are needed when writing a Title, key skills are needed when writing an abstract, key skills are needed when writing an introduction, skills needed when writing a Review of the Literature, skills are needed when writing the Methods.
<b>UNIT-V (4Hrs)</b>	skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions, useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

#### Text Books:

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press

#### Reference Books:

1. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
2. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19AC0002	AC	2	0	0	0	0	0	--

### DISASTER MANAGEMENT

#### Course Objectives:


1. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
3. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
4. Critically understand the strengths and weaknesses of disaster management approaches, planning & programming in different countries, particularly their home country or the countries they work in.

### SYLLABUS

<b>UNIT-I (4Hrs)</b>	<b>Disaster:</b> Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.
<b>UNIT-II (4Hrs)</b>	Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts
<b>UNIT-III (4Hrs)</b>	<b>Disaster Prone Areas In India:</b> Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.
<b>UNIT-IV (4Hrs)</b>	<b>Disaster Preparedness And Management</b> Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.
<b>UNIT-V (4Hrs)</b>	<b>Risk Assessment</b> Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. <b>Disaster Mitigation</b> Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.

#### Text Books:

1.	R. Nishith, Singh AK, Disaster Management in India: Perspectives, issues and strategies New Royal Book Company.
2.	Sahni, Pardeep Et. Al. (Eds.), Disaster Mitigation Experiences And Reflections, Prentice Hall Of India, New Delhi.
3.	Goel S. L. Disaster Administration And Management Text And Case Studies ,Deep & Deep Publication Pvt. Ltd., New Delhi.

  
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Code	Category	L	T	P	C	I.M	E.M	Exam
M19AC0003	AC	2	0	0	0	0	0	--
<b>SANSKRIT FOR TECHNICAL KNOWLEDGE</b>								
<b>Course Objectives:</b>								
1.	To get a working knowledge in illustrious Sanskrit, the scientific language in the world							
2.	Learning of Sanskrit to improve brain functioning							
3.	Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power							
4.	The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Understanding basic Sanskrit language.							K2
2	Ancient Sanskrit literature about science & technology can be understood.							K2
3	Being a logical language will help to develop logic in students.							K6
<b>SYLLABUS</b>								
<b>UNIT-I (7Hrs)</b>	Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences							
<b>UNIT-II (7Hrs)</b>	Order, Introduction of roots, Technical information about Sanskrit Literature							
<b>UNIT-III (7Hrs)</b>	Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics							
<b>Text Books:</b>								
1.	"AbhyasaPustakam" – Dr.Vishwas, Samskrita-Bharati Publication, New Delhi							
2.	"Teach Yourself Sanskrit" PrathamaDiksha-VempatiKutumbasastry, Rashtriya Sanskrit Sansthanam, New Delhi Publication							
3.	"India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi							

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19AC0004	AC	2	0	0	0	0	0	--
<b>VALUE EDUCATION</b>								
<b>Course Objectives:</b>								
1.	Understand the value of education and self- development							
2.	Imbibe good values in students							
3.	Let should know about the importance of character							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Knowledge of self-development							K1
2	Learn the importance of Human values							K2
3	Developing the overall personality							K3
<b>SYLLABUS</b>								
<b>UNIT-I (4Hrs)</b>	Values and self-development –Social values and individual attitudes. Work ethics, Indian vision of humanism.Moral and non- moral valuation. Standards and principles. Value judgements.							
<b>UNIT-II (4Hrs)</b>	Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity, Patriotism, Love for nature ,Discipline							
<b>UNIT-III (4Hrs)</b>	Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation, Doing best for saving nature							
<b>UNIT-IV (4Hrs)</b>	Character and Competence –Holy books vs Blind faith.Self-management and Good health. Science of reincarnation. Equality, Nonviolence ,Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.							
<b>Text Books:</b>								
1.	Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi							

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19AC0005	AC	2	0	0	0	0	0	--

### CONSTITUTION OF INDIA

#### Course Objectives:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution

#### Course Outcomes

S.No	Outcome	Knowledge Level
1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.	K2
2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.	K2
3	Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.	K2
4	Discuss the passage of the Hindu Code Bill of 1956.	K2

### SYLLABUS

<b>UNIT-I (4Hrs)</b>	<b>History of Making of the Indian Constitution:</b> History , Drafting Committee, ( Composition & Working)
<b>UNIT-II (4Hrs)</b>	Philosophy of the Indian Constitution: Preamble ,Salient Features
<b>UNIT-III (4Hrs)</b>	Fundamental Rights,Right to Equality, Right to Freedom,Right against Exploitation, Right to Freedom of Religion,Cultural and Educational Rights,Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties
<b>UNIT-IV (4Hrs)</b>	<b>Organs of Governance:</b> Parliament, Composition, Qualifications and Disqualifications ,Powers and Functions, Executive, President , Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions <b>Local Administration:</b> District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zilla Panchayat. Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy



<b>UNIT-V</b> <b>(4Hrs)</b>	<b>Election Commission:</b> Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.
<b>Text Books:</b>	
1.	The Constitution of India, 1950 (Bare Act), Government Publication.
2.	Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3.	M. P. Jain, Indian Constitution Law, 7th Edn., LexisNexis, 2014.
4.	D.D. Basu, Introduction to the Constitution of India, LexisNexis, 2015.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19AC0006	AC	2	0	0	0	0	0	--
<b>PEDAGOGY STUDIES</b>								
<b>SYLLABUS</b>								
<b>UNIT-I (4Hrs)</b>	<b>Introduction and Methodology:</b> Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.							
<b>UNIT-II (4Hrs)</b>	Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.							
<b>UNIT-III (4Hrs)</b>	Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.							
<b>UNIT-IV (4Hrs)</b>	Theory of change, Strength and nature of the body of evidence for effective pedagogical practices Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies. Professional development: alignment with classroom practices and follow-up support							
<b>UNIT-V (4Hrs)</b>	<b>Research gaps and future directions:</b> Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.							
<b>Text Books:</b>								
1.	Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.							
2.	Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.							
3.	Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.							
4.	Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal of Educational Development, 33 (3): 272-282.							
5.	Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.							
6.	Chavan M (2003) Read India: A mass scale, rapid, „learning to read“ campaign.							
7.	<a href="http://www.pratham.org/images/resource%20working%20paper%202.pdf">www.pratham.org/images/resource%20working%20paper%202.pdf</a> .							

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19AC0007	AC	2	0	0	0	0	0	--
<b>STRESS MANAGEMENT BY YOGA</b>								
<b>Course Objectives:</b>								
1.	To achieve overall health of body and mind							
2.	To overcome stress							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Develop a healthy mind in a healthy body thus improving social health also.							K2
2	Improve efficiency							K2
<b>SYLLABUS</b>								
<b>UNIT-I</b> (7Hrs)	Definitions of Eight parts of yoga ( Ashtanga )							
<b>UNIT-II</b> (7Hrs)	Yam and Niyam. Do's and Don'ts in life. i) Ahinsa, satya, astheya, brahmacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishvarapranidhana							
<b>UNIT-III</b> (7Hrs)	Asan and Pranayam i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects-Types pranayama							
<b>Text Books:</b>								
1.	'Yogic Asanas for Group Training-Part-I' : Janardan Swami YogabhyasiMandal, Nagpur							
2.	"Raja Yoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata							

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19AC0008	AC	2	0	0	0	0	0	--
<b>PERSONALITY DEVELOPMENT THROUGH LIFEENLIGHTENMENT SKILLS</b>								
<b>Course Objectives:</b>								
1.	To learn to achieve the highest goal happily							
2.	To become a person with a stable mind, pleasing personality and determination							
3.	To awaken wisdom in students							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life.							K2
2	The person who has studied Geeta will lead the nation and mankind to peace and prosperity.							K2
3	Study of Neetishatakam will help in developing versatile personality of students.							K2
<b>SYLLABUS</b>								
<b>UNIT-I (7Hrs)</b>	Neetisatakam-Holistic development of personality Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue),Verses- 52,53,59 (don'ts),Verses- 71,73,75,78 (do's)							
<b>UNIT-II (7Hrs)</b>	Approach to day to day work and duties. ShrimadBhagwadGeeta : Chapter 2-Verses: 41, 47,48 Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.							
<b>UNIT-III (7Hrs)</b>	Statements of basic knowledge, ShrimadBhagwadGeeta: Chapter2-Verses 56, 62, 68, Chapter 12 -Verses 13, 14, 15, 16,17, 18, Personality of Role model. ShrimadBhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39, Chapter18 – Verses 37,38,63							
<b>Text Books:</b>								
1.	'Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department), Kolkata							
2.	Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath,Rashtriya Sanskrit Sansthanam, New Delhi.							

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Estd:1980

**SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE  
(AUTONOMOUS)**

(Affiliated to JNTUK, Kakinada), (Recognized by AICTE, New Delhi)

Accredited by NAAC with 'A' Grade

CHINNA AMIRAM (P.O):: BHIMAVARAM :: W.G.Dt., A.P., INDIA :: PIN: 534 204

**SCHEME OF INSTRUCTION & EXAMINATION  
(Regulation R19)**

**M.TECH –COMMUNICATION SYSTEMS**

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

(With effect from 2019-2020 Admitted Batch  
onwards) **II-SEMESTER**

Subject code	Name of the Subject	Category	C	L	T	P	Internal Marks	External Marks	Total Marks
M19 CS 1201	Wireless Communications and Networks	PC	3	3	0	0	25	75	100
M19 CS 1202	Image and Video Processing	PC	3	3	0	0	25	75	100
#PE-III	Elective-III	PE	3	3	0	0	25	75	100
#PE-IV	Elective-IV	PE	3	3	0	0	25	75	100
M19 CS 1209	Advanced Communications Lab	PC	2	0	0	4	25	75	100
M19 CS 1210	Advanced Digital Image and Video Processing Laboratory	PC	2	0	0	4	25	75	100
M19 CS 1211	Mini Project with Seminar	PC	2	0	0	4	100	0	100
#AC-2	Audit Course 2	AC	0	2	0	0	0	0	0
Total			<b>18</b>	<b>14</b>	<b>0</b>	<b>12</b>	<b>250</b>	<b>450</b>	<b>700</b>

	Course Code	Course
#PE-III	M19 CS 1203	Soft Computing Techniques
	M19 CS 1204	Internet Protocols
	M19 CS 1205	Cyber Security
#PE-IV	M19 CS 1206	Optical Networks
	M19 CS 1207	Digital Signal Processors and Architectures
	M19 CS 1208	Radio Navigational Aids

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS1201	PC	3	0	0	3	25	75	3 Hrs.

### WIRELESS COMMUNICATIONS AND NETWORKS

**Course Objectives:** The main objectives of this subject are:

1	An understanding on functioning of wireless communication system and evolution of different wireless communication systems and standards.
2	An ability to compare recent technologies used for wireless communication.
3	An ability to explain the architecture, functioning, protocols, capabilities and application of various wireless communication networks
4	An ability to explain multiple access techniques for Wireless Communication
5	An ability to evaluate design challenges, constraints and security issues associated with Ad-hoc wireless networks.

**Course Outcomes**

S.No	At the end of this course the student will be able to:	Knowledge Level
1	Understand Cellular communication concepts	K1
2	Study the mobile radio propagation	K1
3	Study the wireless networks and different types of MAC protocols	K1

### SYLLABUS

<b>UNIT-I (10 Hrs)</b>	<p><b>The Cellular Concept-System Design Fundamentals:</b> Introduction, Frequency Reuse, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Improving Coverage &amp; Capacity in Cellular Systems- Cell Splitting, Sectoring, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Trunking and Grade of Service</p>
<b>UNIT-II (10 Hrs.)</b>	<p><b>Mobile Radio Propagation: Large-Scale Path Loss:</b> Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, Basic Propagation Mechanisms, Reflection: Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction: Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.</p>
<b>UNIT-III (8 Hrs.)</b>	<p><b>Mobile Radio Propagation: Small –Scale Fading and Multipath</b> Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and</p>

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	Received power, Small Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.
<b>UNIT-IV (10 Hrs.)</b>	<b>Equalization and Diversity</b> Introduction, Fundamentals of Equalization, Training a Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity -Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.
<b>UNIT-V (10 Hrs.)</b>	<b>Wireless Networks:</b> Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hyper Lan, WLL.
<b>Text Books:</b>	
1.	Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2 <sup>nd</sup> Ed., 2002, PHI.
2.	Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3.	Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012
<b>Reference Book:</b>	
1.	Principles of Wireless Networks – KavehPahLaven and P. Krishna Murthy, 2002, PE
2.	Wireless Digital Communications – KamiloFeher, 1999, PHI.
3.	Wireless Communication and Networking – William Stallings, 2003, PHI.
4.	Wireless Communication – UpenDalal, Oxford Univ.
5.	Press Wireless Communications and Networking – Vijay K. Gary, Elsevier.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19CS1202	PC	3	0	0	3	25	75	3 Hrs.

### IMAGE AND VIDEO PROCESSING

#### Course Objectives:

1	The basic concepts and methods to develop foundation in digital image processing and video processing are introduced and The Importance of various image transforms, image transform properties are discussed.
2	Understanding the image enhancement techniques in both spatial domain and frequency domain.
3	The process of recovering image that has been degraded by noise or any other degradation phenomenon.
4	Understanding the importance of image segmentation and various methods used for segmentation, The importance of reducing the data for digital image representation by using various image compression techniques
5	To understand the importance of video processing in multimedia and the various video formation models, motion estimation techniques in video processing
6	Applications of motion estimation in video processing

#### Course Outcomes

S.No	Outcome	Knowledge Level
1	Defining the digital image, representation of digital image, importance of image resolution, applications in image processing.	K2
2	Know the advantages of representation of digital images in transform domain, application of various image transforms	K2
3	Know how an image can be enhanced by using histogram techniques, filtering techniques etc.	K3
4	Understand image degradation, image restoration techniques using spatial filters and frequency domain	K3
5	Know the detection of point, line and edges in images, edge linking through local processing, global processing.	K3
6	Understand the redundancy in images, various image compression techniques.	K2
7	Know the video technology from Analog colour TV systems to digital video systems, how video signal is sampled and filtering operations in video processing.	K2
8	Know the general methodologies for 2D motion estimation, various coding used in video processing	K3

### SYLLABUS

<b>UNIT-I (10 Hrs)</b>	<b>Fundamentals of Image Processing and Image Transforms:</b> Introduction, Image sampling, Quantization, Resolution, Image file formats, Elements of image processing system, Applications of Digital image processing Introduction, Need for transform, image transforms, Fourier transform, 2 D Discrete Fourier transform and its transforms, Importance of phase, Walsh transform, Hadamard transform, Haar transform, slant transform Discrete cosine transform, KL transform, singular value decomposition, Radon transform, comparison of different image transforms.
<b>UNIT-II (10 Hrs)</b>	<b>Image Enhancement:</b> Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters. Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

  
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	<b>Image Restoration:</b> Introduction to Image restoration, Image degradation, Types of image blur, Classification of image restoration techniques, Image restoration model, Linear and Nonlinear image restoration techniques, Blind deconvolution.
<b>UNIT-III (10 Hrs)</b>	<b>Image Segmentation:</b> Introduction to image segmentation, Point, Line and Edge Detection, Region based segmentation., Classification of segmentation techniques, Region approach to image segmentation, clustering techniques, Image segmentation based on thresholding, Edge based segmentation, Edge detection and linking, Hough transform, Active contour <b>Image Compression:</b> Introduction, Need for image compression, Redundancy in images, Classification of redundancy in images, image compression scheme, Classification of image compression schemes, Fundamentals of information theory, Run length coding, Shannon – Fano coding, Huffman coding, Arithmetic coding, Predictive coding, Transformed based compression, Image compression standard, Wavelet-based image compression, JPEG Standards.
<b>UNIT-IV (8 Hrs)</b>	<b>Basic Steps of Video Processing:</b> Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.
<b>UNIT-V (10 Hrs)</b>	<b>2-D Motion Estimation:</b> Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.
<b>Text Books:</b>	
1.	Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.
2.	Video Processing and Communication – Yao Wang, JoemOstermann and Ya–quin Zhang. 1st Ed., PH Int.
3.	S.Jayaraman, S.Esakkirajan and T.VeeraKumar, “Digital Image processing, Tata McGraw Hill publishers, 2009
<b>Reference Books:</b>	
1.	Digital Image Processing and Analysis-Human and Computer Vision Application with CVIP Tools – ScotteUmbaugh, 2nd Ed, CRC Press, 2011.
2.	Digital Video Processing – M. Tekalp, Prentice Hall International.
3.	Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH, 2009.
4.	Multidimensional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.
5.	Digital Image Processing with MATLAB and Labview – Vipula Singh, Elsevier.
6.	Video Demystified – A Hand Book for the Digital Engineer – Keith Jack, 5th Ed., Elsevier.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1203	PE	3	0	0	3	25	75	3 Hrs.

### SOFT COMPUTING TECHNIQUES

(Program Elective-III)

#### Course Objectives:

1	To study the soft computing basics
2	To Understand the basic implementation details on Artificial Neural Networks
3	To understand fuzzy logic and its application in ANN.
4	To study the Genetic algorithm and its application
5	To study the applications of Soft Computing.

#### Course Outcomes

S.No	Outcome	Knowledge Level
1	Understand the basic concepts of Artificial neural network systems.	K2
2	Understand the McCulloch-Pitts neuron model, simple and multilayer Perception, Adeline and Madeline concepts	K2
3	Data processing, Hopfield and self-organizing network.	K3
4	Difference between crisp sets to fuzzy sets, fuzzy models, fuzzification, inference, membership functions, rule based approaches and defuzzification.	K2
5	Self-organizing fuzzy logic control, nonlinear time delay systems.	K2
6	Understand the concept of Genetic Algorithm steps. Tabu, ant-colony search techniques for solving optimization problems.	K3
7	GA applications to power system optimization problems, identification and control of linear and nonlinear dynamic systems using MATLAB-Neural network toolbox.	K3
8	Know the application and importance of stability analysis	K3

### SYLLABUS

<b>UNIT-I</b> (10 Hrs.)	<b>Introduction:</b> Approaches to intelligent control, Architecture for intelligent control, Symbolic reasoning system, Rule-based systems, the AI approach, Knowledge representation - Expert systems.
<b>UNIT-II</b> (10 Hrs.)	<b>Artificial Neural Networks:</b> Concept of Artificial Neural Networks and its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron, Learning and Training the neural network, Data Processing: Scaling, Fourier transformation, principal-component analysis and wavelet transformations, Hopfield network, Self-organizing network and Recurrent network, Neural Network based controller.
<b>UNIT-III</b> (10 Hrs.)	<b>Fuzzy Logic System:</b> Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning, Introduction to fuzzy logic modelling and control, Fuzzification, inferencing and defuzzification, Fuzzy knowledge and rule bases, Fuzzy modelling and control schemes for nonlinear systems, Self-organizing fuzzy logic control, Fuzzy logic control for nonlinear time delay system.
<b>UNIT-IV</b> (10 Hrs.)	<b>Genetic Algorithm:</b> Basic concept of Genetic algorithm and detail algorithmic steps, Adjustment of free parameters, Solution of typical control problems using genetic algorithm, Concept on some other search techniques like Tabu search and ant-colony search techniques for solving optimization problems.

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<b>UNIT-V</b> <b>(8 Hrs.)</b>	<b>Applications:</b> GA application to power system optimisation problem, Case studies: Identification and control of linear and nonlinear dynamic systems using MATLAB-Neural Network toolbox, Stability analysis of Neural Network interconnection systems, Implementation of fuzzy logic controller using MATLAB fuzzy-logic toolbox, Stability analysis of fuzzy control systems.
<b>Text Books:</b>	
1.	Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2.	Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.
<b>Reference Books:</b>	
1.	Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
2.	Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers, 1994.
3.	Introduction to Fuzzy Control - Driankov, Hellendroon, Narosa Publishers.
4.	Artificial Neural Networks - Dr. B. Yagananarayana, 1999, PHI, New Delhi.
5.	Elements of Artificial Neural Networks - Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
6.	Artificial Neural Network –Simon Haykin, 2 <sup>nd</sup> Ed., Pearson Education.
7.	Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa, 1/e, TMH, New Delhi.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1204	PE	3	0	0	3	25	75	3 Hrs.

### INTERNET PROTOCOLS

(Program Elective-III)

#### Course Objectives:

1	To provide theoretical and practical knowledge about the TCP/IP networking, which are fundamental to understand the architecture of the Internet.
2	To explore Concepts like switching, multiplexing, naming, addressing, routing, quality of service, flow and congestion control through their implementation in TCP/IP protocol suite.

#### Course Outcomes

S.No	Outcome	Knowledge Level
1	Understanding basic network routing concepts and algorithms	K2
2	Understanding how to apply them into given topologies	K3
3	Understanding how the Internet protocol suite operates and describe the functions of various protocols	K1
4	Explain the concept and usage of node addressing and classify addresses into network layers.	K3

### SYLLABUS

<b>UNIT-I</b> <b>(10 Hrs.)</b>	<p><b>Internetworking Concepts:</b> Principles of Internetworking, Connectionless Internetworking, Application level Interconnections, Network level Interconnection, Properties of the Internet, Internet Architecture, Wired LANS, Wireless LANs, Point-to-Point WANs, Switched WANs, Connecting Devices, TCP/IP Protocol Suite.</p> <p><b>IP Address:</b> Class full Addressing: Introduction, Class full Addressing, Other Issues, Sub-netting and Super-netting Classless Addressing: Variable length Blocks, Sub-netting, Address Allocation. Delivery, Forwarding, and Routing of IP Packets: Delivery, Forwarding, Routing, Structure of Router. ARP and RARP: ARP, ARP Package, RARP.</p>
<b>UNIT-II</b> <b>(10 Hrs.)</b>	<p><b>Internet Protocol (IP):</b> Datagram, Fragmentation, Options, Checksum, IP V.6.</p> <p><b>Transmission Control Protocol (TCP):</b> TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Flow Control, Error Control, Congestion Control, TCP Times.</p> <p><b>Stream Control Transmission Protocol (SCTP):</b> SCTP Services, SCTP Features, Packet Format, Flow Control, Error Control, Congestion Control.</p> <p><b>Mobile IP:</b> Addressing, Agents, Three Phases, Inefficiency in Mobile IP.</p> <p><b>Classical TCP Improvements:</b> Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/ Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.</p>
<b>UNIT-III</b> <b>(10 Hrs.)</b>	<p><b>Unicast Routing Protocols (RIP, OSPF, and BGP):</b> Intra and Inter-domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF,</p>



	Path Vector Routing, BGP. <b>Multicasting and Multicast Routing Protocols:</b> Unicast - Multicast- Broadcast, Multicast Applications, Multicast Routing, Multicast Link State Routing: MOSPF, Multicast Distance Vector: DVMRP.
<b>UNIT-IV (10 Hrs.)</b>	<b>Domain Name System (DNS):</b> Name Space, Domain Name Space, Distribution of Name Space, and DNS in the internet. <b>Remote Login TELNET:</b> Concept, Network Virtual Terminal (NVT). <b>File Transfer FTP and TFTP:</b> File Transfer Protocol (FTP). <b>Electronic Mail:</b> SMTP and POP. <b>Network Management-SNMP:</b> Concept, Management Components, World Wide Web-HTTP Architecture.
<b>UNIT-V (8 Hrs.)</b>	<b>Multimedia:</b> Digitizing Audio and Video, Network security, security in the internet firewalls. Audio and Video Compression, Streaming Stored Audio/Video, Streaming Live Audio/Video, Real-Time Interactive Audio/Video, RTP, RTCP, Voice Over IP. Network Security, Security in the Internet, Firewalls.
<b>Text Books:</b>	
1.	TCP/IP Protocol Suite- Behrouz A. Forouzan, Third Edition, TMH
2.	Internetworking with TCP/IP Comer 3 rd edition PHI
<b>Reference Books:</b>	
1.	High performance TCP/IP Networking- Mahbub Hassan, Raj Jain, PHI, 2005
2.	Data Communications & Networking – B.A. Forouzan– 2nd Edition – TMH
3.	High Speed Networks and Internets- William Stallings, Pearson Education, 2002
4.	Data and Computer Communications, William Stallings, 7th Edition., PEI.
5.	The Internet and Its Protocols – AdrinFarrel, Elsevier, 2005.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1205	PE	3	0	0	3	25	75	3 Hrs.

**CYBER SECURITY**  
**(Program Elective-III)**

**Course Objectives:**

1.	To gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
2.	To understand principles of web security.
3.	To gain familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath.
4.	To gain an understanding of cryptography, how it has evolved, and some key encryption techniques used today.
5.	To incorporate approaches for incident analysis and response.
6.	To develop an understanding of security policies (such as confidentiality, integrity, and availability), as well as protocols to implement such policies.

**Course Outcomes**

S.No	Outcome	Knowledge Level
1	Understand Cyber Security architecture principles	K2
2	Identify System and application security threats and vulnerabilities	K1
3	Identify different classes of attacks	K1
4	Cyber Security incidents to apply appropriate response	K3
5	Describing risk management processes and practices	K1
6	Evaluation of decision making outcomes of Cyber Security scenario	K3

**SYLLABUS**

<b>UNIT-I</b> <b>(10 Hrs)</b>	<b>Introduction:</b> Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.
<b>UNIT-II</b> <b>(10 Hrs)</b>	<b>Conventional Encryption:</b> Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC
<b>UNIT-III</b> <b>(10 Hrs)</b>	<b>Number Theory:</b> Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder theorem, Discrete logarithms <b>Public key:</b> Public key cryptography principles, public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service

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<b>UNIT-IV (8 Hrs)</b>	<b>IP Security:</b> IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management <b>Transport Level Security:</b> Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET) <b>Email Privacy:</b> Pretty Good Privacy (PGP) and S/MIME.
<b>UNIT-V (10 Hrs)</b>	<b>Intrusion Detection:</b> Intruders, Intrusion Detection systems, Password Management. <b>Malicious Software:</b> Viruses and related threats & Countermeasures. <b>Fire walls:</b> Firewall Design principles, Trusted Systems.
<b>Text Books:</b>	
1.	Network Security & Cryptography: Principles and Practices, William Stallings, PEA, Sixth edition.
2.	Hack Proofing your Network, Russell, Kaminsky, Forest Puppy, Wiley Dreamtech
<b>Reference Books:</b>	
1.	Network Security & Cryptography, Bernard Menezes, Cengage,2010

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1206	PC	3	0	0	3	25	75	3 Hrs.
<b>OPTICAL NETWORKS</b>								
<b>(Program Elective-IV)</b>								
<b>Course Objectives:</b> To learn about								
1.	Various components of optical networks							
2.	Multiplexing techniques and fibre characteristics							
3.	First generation and broadcast optical network							
4.	Network management and access networks							
5.	Various photonic switches							
<b>Course Outcomes</b>								
S.No	Outcome							Knowledge Level
1	Able to Contribute in the areas of optical network and WDM network design.							K3
2	Able to Implement simple optical network and understand further technology developments for future enhanced network.							K3
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs.)</b>	<b>Client Layers of Optical Networks:</b> SONET / SDH – Multiplexing, Frame Structure, Physical Layer, Infrastructure, ATM – Functions, Adaptation layers, QoS, Flow Control Signaling and Routing, IP – Routing, QoS, MPLS, Storage Area Networks – ESCON, Fiber Channel, HIPPI, Gigabit Ethernet.							
<b>UNIT-II</b> <b>(10 Hrs.)</b>	<b>WDM network Elements and Design:</b> Optical Line Terminals and Amplifiers, Add/Drop Multiplexers, Optical Cross Connects, Costtrade-offs in Network Design, LTD and RWA Problems, Dimensioning – Wavelength Routing Networks, Statistical and Maximum Load Dimensioning Models.							
<b>UNIT-III</b> <b>(10 Hrs.)</b>	<b>Network Control and Management:</b> Network Management Functions, Optical Layer Services and Interfacing, Layers within Optical Layer, Multivendor Interoperability, Performance and Fault Management, Configuration Management, Optical Safety.							
<b>UNIT-IV</b> <b>(10 Hrs.)</b>	<b>Network Survivability:</b> Basic Concepts of Survivability, Protection in SONET/SDH Links and Rings, Protection in IP Networks, Optical Layer Protection – Service Classes, Protection Schemes, Interworking between Layers.							
<b>UNIT-V</b> <b>(8 Hrs.)</b>	<b>Access Networks and Photonic Packet Switching:</b> Network Architecture, Enhanced HFC, FTTC, Photonic Packet Switching – OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Test Beds.							
<b>Text Books:</b>								
1.	Optical Networks: A Practical Perspective - Rajiv Ramaswami and Kumar N. Sivarajan, 2 <sup>nd</sup> Ed., 2004, Elsevier Morgan Kaufmann Publishers (An Imprint of Elsevier).							
2.	WDM Optical Networks: Concepts, Design and Algorithms – C. Siva Rama Murthy and Mohan Guruswamy 2 <sup>nd</sup> Ed., 2003, PEI.							
3.	Optical Networks: Third Generation Transport Systems – Uyles Black, 2 <sup>nd</sup> Ed., 2009, PEI.							

  
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<b>Reference Books:</b>	
1.	Optical Fiber Communications: Principles and Practice – John.M.Senior, 2 <sup>nd</sup> Ed., 2000, PE.
2.	Fiber Optics Communication – Harold Kolimbris, 2 <sup>nd</sup> Ed., 2004, PEI.
3.	Networks – Timothy S. Ramteke, 2 ed., 2004, PEI.
4.	Optical Fiber Communications – GovindAgarwal, 2 <sup>nd</sup> Ed., 2004, TMH.
5.	Optical Fiber Communications and Its Applications – S.C.Gupta, 2004, PHI.
6.	Telecommunication System Engineering –Roger L.Freeman, 4 <sup>th</sup> Ed., John Wiley, 2004.

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<b>Code</b>	<b>Category</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>I.M</b>	<b>E.M</b>	<b>Exam</b>
M19 CS 1207	PE	3	0	0	3	25	75	3 Hrs.

**DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES**  
(Program Elective-IV)

**Course Objectives:**

1.	To study the basic DFT, FFT and rate conversion algorithms.
2.	To study the number format, dynamic range and sources of errors in DSP systems.
3.	To learn about TMS programmable DSPs and their programming capabilities.
4.	To understand basic DSP algorithms on TMS processor.
5.	To study the FFT algorithms on TMS320C54XX DSP device.

**Course Outcomes**

S.No	Outcome At the end of this course, students will be able to	Knowledge Level
1	Identify and formalize architectural level characterization of P-DSP hardware	K1
2	Ability to design, programming (assembly and C), and testing code using Code Composer Studio environment	K3
3	Deployment of DSP hardware for Control, Audio and Video Signal processing applications	K3
4	Understanding of major areas and challenges in DSP based embedded systems.	K1

**SYLLABUS**

<b>UNIT-I</b> (10 Hrs)	<p><b>Introduction to Digital Signal Processing:</b> Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.</p> <p><b>Computational Accuracy in DSP Implementations:</b> Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.</p>
<b>UNIT-II</b> (10 Hrs)	<p><b>Architectures for Programmable DSP Devices:</b> Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External interfacing.</p>
<b>UNIT-III</b> (10 Hrs)	<p><b>Programmable Digital Signal Processors:</b> Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.</p>
<b>UNIT-IV</b> (8 Hrs)	<p><b>Analog Devices Family of DSP Devices:</b> Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. Introduction to Black fin Processor - The Black fin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address</p>

  
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	Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.
<b>UNIT-V (10 Hrs)</b>	<b>Interfacing Memory and I/O Peripherals to Programmable DSP Devices:</b> Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).
<b>Text Books:</b>	
1.	Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2.	A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009
3.	EmbeddedSignalProcessingwiththeMicroSignalArchitecturePublisher: Woon-SengGan, Sen M. Kuo, Wiley-IEEE Press, 2007
<b>Reference Books:</b>	
1.	Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2.	Digital Signal Processing –Jonatham Stein, 2005, John Wiley.
3.	DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4.	Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
5.	<i>The Scientist and Engineer's Guide to Digital Signal Processing</i> by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997
6.	Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes , ISBN 0750679123, 2005

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1208	PE	3	0	0	3	25	75	3 Hrs.
<b>RADIO NAVIGATIONAL AIDS</b>								
<b>(Program Elective-IV)</b>								
<b>Course Objectives:</b>								
1.	To learn about Navigational Systems and Inertial navigation							
2.	To acquire knowledge about and Global Positioning System and its applications in navigation							
3.	To become familiar with the concepts of Differential GPS and Wide Area Augmentation System							
<b>Course Outcomes</b>								
S.No	At the end of this course, students will be able to							Knowledge Level
1	Acquire knowledge about Navigational systems							K1
2	Analyse the concepts of GPS and its applications in Navigation							K3
3	Foster ability to work using Instrument Landing System.							K3
4.	Acquire knowledge about Satellite Navigation System.							K1
<b>SYLLABUS</b>								
<b>UNIT-I</b> <b>(10 Hrs)</b>	<b>Navigational Systems:</b> Review of Navigational Systems: Aircraft navigational system, Geometry of the earth. Navigation equation, Navigation errors, Radio navigation system types and Performance parameters, ILS System, Hyperbolic navigation systems, Loran, Omega, Decca Radio direction finding, DME, TACAN and VORTAC.							
<b>UNIT-II</b> <b>(10 Hrs)</b>	<b>Inertial Navigation:</b> Inertial navigation system ,Sensing instruments: Accelerometer. Gyro- copes, Analytic and Gimbaled platforms, Mechanization, Error analysis, Alignment.							
<b>UNIT-III</b> <b>(10 Hrs)</b>	<b>Global Positioning System (GPS) for Navigation:</b> Overview of GPS, Reference systems ,Satellite orbits, Signal structure, Geometric dilution of precision (GDOP), or Precision dilution of recision (PDOP), Satellite ephemeris, Satellite clock, Ionospheric group delay ,Tropospheric group delay, Multipath errors and Receiver measurement errors.							
<b>UNIT-IV</b> <b>(10 Hrs)</b>	<b>Differential GPS and WAAS:</b> Standard and precise positioning service local area DGPS and Wide area DGPS errors, Wide Area Augmentation System (WAAS) architecture, Link budget and Data Capacity, Ranging function, Precision approach and error estimates.							
<b>UNIT-V</b> <b>(8 Hrs)</b>	<b>GPS Navigational Applications:</b> General applications of GPS, DGPS, Marine, Air and Land Navigation, Surveying, Mapping and Geographical information systems, Military and Space							
<b>Text Books:</b>								
1.	Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.							
2.	Parkinson. BW. Spilker - "Global Positioning System Theory and Applications", Progress in Astronautics, Vol. I and II, 1996.							

  
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Reference Books:	
1.	Hoffman. B., Wellenhof. H... Lichtenegger and J. Collins - "GPS Theory andPractice", Springer Verlag Wien New York, 1992.
2.	Elliot D. Kaplan - "Understanding GPS Principles and Applications", Artech House. Inc., 1996.
3.	Lieck Alfred. - "GPS Satellite Surveying", John Wiley, 1990.

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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1209	PC	0	0	4	2	25	75	3 Hrs.

### ADVANCED COMMUNICATIONS LAB

#### Course Objectives:

1. To apply the concepts of measurement of bit error rate, Hamming distance and coding techniques.
2. To simulate and calculate efficiency of spread spectrum techniques.
3. To implement filter response on DSP trainer kit.
4. To analyse the characteristics of Optical Fibre and Laser Diode.

#### Course Outcomes

S.No	At the end of this course, students will be able to	Knowledge Level
1.	Apply the concepts of measurement of bit error rate, Hamming distance and coding techniques.	K3
2.	Simulate and calculate efficiency of spread spectrum techniques.	K3
3.	Implement filter response on DSP trainer kit.	K3
4.	Analyse the characteristics of Optical Fibre and Laser Diode.	K4

#### Note:

- A. Minimum of 10 Experiments have to be conducted
- B. All Experiments may be Simulated using MATLAB and to be verified using related training kits

#### List of Experiments

1.	Measurement of Bit Error Rate using Binary Data
2.	Verification of minimum distance in Hamming code
3.	Determination of output of Convolutional Encoder for a given sequence
4.	Determination of output of Convolutional Decoder for a given sequence
5.	Efficiency of DS Spread- Spectrum Technique
6.	Simulation of Frequency Hopping (FH) system
7.	Effect of Sampling and Quantization of Digital Image
8.	Verification of Various Transforms (FT / DCT/ Walsh / Hadamard) on a given Image ( Finding Transform and Inverse Transform)
9.	Point, Line and Edge detection techniques using derivative operators.
10.	Implementation of FIR filter using DSP Trainer Kit (C-Code/ Assembly code)
11.	Implementation of IIR filter using DSP Trainer Kit (C-Code/ Assembly code)
12.	Determination of Losses in Optical Fibre
13.	Observing the Waveforms at various test points of a mobile phone using Mobile Phone Trainer
14.	Study of Direct Sequence Spread Spectrum Modulation & Demodulation using CDMA-DSS-BER Trainer
15.	Study of ISDN Training System with Protocol Analyser
16.	Characteristics of LASER Diode.

#### Reference Books:

1	Optical Fibre Communications: Principles and Practice – John.M.Senior, 2 <sup>nd</sup> Ed., 2000, PE.
2	Data Communications and Networking, Behrouz A.Forouzan, 4 <sup>th</sup> Ed, Tata Mc-Graw Hill
3	Digital communications, John G Proakis, Mc-Graw Hill
4	Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis, D. G. Manolakis, 4th Ed., PHI.
5	DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 Ed., Pearson Education

  
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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1210	PC	0	0	4	2	25	75	3 Hrs.
<b>ADVANCED DIGITAL IMAGE AND VIDEO PROCESSING LABORATORY</b>								
<b>Course Objectives:</b>								
1.	To apply processing algorithms to enhance images and videos.							
2.	To apply compression and segmentation techniques of Images and Videos.							
3.	To apply object detection techniques in Image/ Video							
<b>Course Outcomes</b>								
S.No	Outcome	Knowledge Level						
	At the end of this course, students will be able to							
1	Perform image and video enhancement	K3						
2	Perform image and video segmentation	K3						
3	Detect an object in an image/video	K3						
<b>LIST OF EXPERIMENTS</b>								
1.	Perform basic operations on images like addition, subtraction etc.							
2.	Plot the histogram of an image and perform histogram equalization							
3.	Implement segmentation algorithms							
4.	Perform video enhancement							
5.	Perform video segmentation							
6.	Perform image compression using lossy technique							
7.	Perform image compression using lossless technique							
8.	Perform image restoration							
9.	Convert a colour model into another							
10.	Calculate boundary features of an image							
11.	Calculate regional features of an image							
12.	Detect an object in an image/video using template matching/Bayes classifier							
<b>Text Books:</b>								
1.	Digital Image Processing – Gonzaleze and Woods, 3rd Ed., Pearson.							
2.	Fundamentals of Digital Image Processing- Anil K. Jain, Prentice-Hall International Edition							
3.	S.Jayaraman, S.Esakkirajan and T.Veera Kumar, "Digital Image processing, Tata McGraw Hill publishers, 2009							
4.	Video Processing and Communication – Yao Wang, Joem Ostermann and Ya-quin Zhang. 1stEd., PH Int							
5.	Digital Video Processing – M. Tekalp, Prentice Hall International							
<b>Reference Books:</b>								
1.	Digital Image Processing with MATLAB and Lab view – Vipula Singh, Elsevier.							
2.	Multidimensional Signal, Image and Video Processing and Coding – John Woods, 2nd Ed, Elsevier.							
3.	Hand book of Image and video processing-AL Bovik, Academic Press							

  
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Code	Category	L	T	P	C	I.M	E.M	Exam
M19 CS 1211	MC	0	0	4	2	100	--	3 Hrs.

**MINI PROJECT WITH SEMINAR**

For **Mini Project with Seminar**, a student under the **supervision of a faculty member**, shall collect the **literature on a topic and critically review the literature** and submit it to the department in a **report form** and shall make an **oral presentation** before the **Project Review Committee consisting of Head of the Department, supervisor/mentor and two other senior faculty members** of the department. For Mini Project with Seminar, there will be only **internal evaluation of 100 marks**. A candidate has to secure a minimum of **50% of marks** to be declared successful.

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Code	Category	L	T	P	C	I.M	E.M	Exam
#AC-2	AC	2	0	0	0	0	0	--

**AUDIT COURSE-2**

List of Audit Courses and their Syllabi are mentioned in the First Semester Syllabus.  
The students can opt any one course for AC 2 from the list mentioned in first semester by not opting the course which is already taken for AC 1

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