Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College-Najaf
Techniques of Avionics Engineering Deprt.

Engineering Technical College-Najaf
Najaf City / South Street
Mobile: +9647811184744
E-mail: salim2007555@yahoo.com
Post Code: Iraq- Najaf Province-31001
P. O. Box: 226
www.atu.edu.iq

جامعة الفرات الاوسط التقنية

الكلية التقنية الهندسية – النجف

مفردات المناهج الدراسية المقترحة

لقسم تقنيات هندسة الكترونيات الطيران

أعداد

الدكتور المدرس

سالم محسن وادي

2019-2020

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College-Najaf
Techniques of Avionics Engineering Deprt.

Engineering Technical College-Najaf
Najaf City / South Street
Mobile: +9647811184744
E-mail: salim2007555@yahoo.com
Post Code: Iraq- Najaf Province-31001
P. O. Box: 226
www.atu.edu.iq

الوصف الأكاديمي لقسم تقنيات هندسة الكترونيات الطيران

1- **الوزارة**: وزارة التعليم العالي والبحث العلمي
2- **الجامعة – المركز**: جامعة الفرات الاوسط التقنية- الكلية التقنية الهندسية-نجف
3- **اسم القسم العلمي** : قسم تقنيات هندسة الكترونيات الطيران
4- **اسم الشهادة النهائية** : بكالوريوس تقني في هندسة الكترونيات الطيران
5- **النظام الدراسي**: سنوي
6- **برنامج الاعتماد المعتمد** : ABET
7- **المؤشرات الخارجية الاخرى:**
8- **تاريخ اعداد الوصف**:**2016/01/15**
9- **الرؤيا :**

تتمثل رؤيا قسم هندسة تقنيات الكترونيات الطيران في الكلية التقنية الهندسية-النجف برفد المجتمع بمهندسين تقنيين في مجال هندسة الالكترونيك عامة و الكترونيات الطيران خاصة ذات مستوى عالي من الكفاءة والتفاني والمسؤولية الاخلاقية.

10-الرسالة :

ان مهمة قسم هندسة تقنيات الكترونيات الطيران في الكلية التقنية الهندسية النجف هي:

- **خدمة طلابنا من خلال تعليمهم ;كيفية التعامل مع المشاكل وايجاد الحلول المناسبة، الربط بين النظري والعملي ,ومهارات القيادة والعمل الجماعي، وقيمة الالتزام والسلوك الأخلاقي، واحترام الآخرين.**
- **تقديم خريجين مهندسين تقنيين ذات مستوى اكاديمي عالي ومهارات عملية واسعة في مجال التخصص .**
- **تقديم تكنلوجيا ابداعية لمنفعة المجتمع محليا وعالميا في مجال التخصص.**
- **تقديم بحوث عصرية لحل مشاكل وتطوير اداء المنظومات الالكترونية والكهربائية وانظمة السيطرة في مجال الطيران.**
- **التعاون مع الهيئات المدنية والعسكرية لتسويق مهارات حقل التخصص.**
- **تقديم المشورة للحصول على رخصة الطيران المدنية ورخصة تدريب الخدمة الجوية من وكالة سلامة الطيران الاوربية والرخص الخاصة بالاسناد الارضي ..... الخ**

11- **أهداف القسم**

نظرًا للتقدم العلمي والتكنولوجي السريع في مجال تكنلوجيا الطيران يعمل قسم هندسة تقنية الكترونيات الطيران من أجل تحقيق أهداف استراتيجية واضحة تساعده على تحقيق مكانة بارزة داخل المجتمعات الأكاديمية وهي تتضح في التالي :

1. المحافظة على جودة المناهج الدراسية وتحسينها من خلال :
   - ادخال المواد الدراسية المحدثة علميا ودوليا في دراسة تخصص تكنلوجيا الكترونيات الطيران ومواكبة للتطور العلمي السريع من خلال الاتصال المباشر مع صناع القرار لهندسة الطائرات في كافة انحاء العالم والاتصال المباشر بالكليات والمعاهد المتخصصة بتكنلوجيا الطيران.
   - التقييم والتطوير المستمر للمناهج الدراسية.
   - ربط مشاريع الطلاب والأبحاث باحتياجات المجتمع.
   - توسيع ادراك الطلاب بالزيارات الميدانية للمطارات الداخلية والحلقات الدراسية والتدريب في مدارج المطارات وورش الصيانة.

Engineering Technical College-Najaf
Najaf City / South Street
Mobile: +9647811184744
E-mail: salim2007555@yahoo.com
Post Code: Iraq- Najaf Province-31001
P. O. Box: 226
www.atu.edu.iq

2. استحداث المختبرات العلمية و تزويدها بأحدث الاجهزة والمعدات التقنية بحقل الاختصاص وإدارتها عن طريق مجموعة من الفنين المهرة.

3. توفير البيئة الجامعية الافضل للهيئة التدريسية.

4. المحافظة على التطور الفني لأعضاء هيئة التدريس من خلال:
- تشجيع المشاركة الفعالة في المؤتمرات والاجتماعات الفنيةوخاصة مع ادارات المطارات العراقية والدولية وشركات التدريب العالمية.
- المراجعة المستمرة والتقييم لنشاطاتهم.
- تشجيع مبادرات و انجازات هيئة التدريس.

5. الانتاج المعرفي من خلال :
- القيام بالأبحاث النظرية والتطبيقية المتميزة.
- تشجيع النشرالعلمي وتحفيز العمل الجماعي للمجموعات البحثية في مختلف التخصصات.
- السعي لزيادة مصادر التمويل البحثي من خلال النشر في المجلات الهندسية العالمية .

6. المبادرات الخاصة بتقليص الروتين الاداري وتسهيل اجراءات العمل من خلال الارشاد التربوي و تطوير العلاقة بين الطلبة والتدريسيين.

7. تفعيل وتقوية الروابط مع الجهات الحكومية العامة والقطاع الخاص من خلال:
- تنظيم المؤتمرات, الندوات والدورات التعليمية.
- تشجيع العمل الاستشارى وتوفير الخدمات على المستوى المهني في كافة الاختصاصات الهندسية.

12- مخرجات التعلم المطلوبة وطرائق التعليم والتعلم والتقييم

أ- المعرفة والفهم

1أ- القدرة على تطبيق المعرفة في الرياضيات والعلوم والهندسة.
2أ- فهم المسؤوليات المهنية والاخلاقية لحقل التخصص.
3أ- القدرة على تقييم مخرجات المادة الدراسية مع الهيئة التدريسية والممارسين الصناعيين والمهنيين, فضلا عن أرباب العمل والطلبة الخريجين لتحسينها.
4أ- تعليم مهارات القيادة وقيمة الالتزام والسلوك الاخلاقي واحترام الآخرين.

ب- المهارات الخاصة بالموضوع

1ب- القدرة على العمل والاندماج في فرق متعددة الاختصاصات.
2ب- القدرة على تصميم واجراء التجارب وكذلك تحليل وتفسير البيانات.
3ب- القدرة على استخدام التقنيات الحديثة والمهارات والادوات الهندسية لممارسة الهندسة.
4ب- القدرة على تحديد وصياغة المشاكل الهندسية في حقل التخصص.

ج- مهارات التفكير

1ج- القدرة على التواصل بشكل فعال مع المعنيين بحقل التخصص في الجانبين المدني والعسكري.
2ج- الاعتراف بالحاجة والقدرة على الانخراط في التعلم مدى الحياة.
3ج- معرفة القضايا المعاصرة بحقل التخصص.
4ج- التعلم الواسع الضروري لفهم تأثير الحلول الهندسية على الصعيد العالمي والمشاكل الاقتصادية والبيئية والاجتماعية.

Engineering Technical College-Najaf
Najaf City / South Street
Mobile: +9647811184744
E-mail: salim2007555@yahoo.com
Post Code: Iraq- Najaf Province-31001
P. O. Box: 226
www.atu.edu.iq

د- **المهارات العامة والمنقولة(المهارات الاخرى المتعلقة بقابلية التوظيف والتطور الشخصي)**

1د- القدرة على الادارة والعمل على معدات الاسناد الارضية والجوية للطائرات.

2د- القدرة على التصميم الالكتروني للمنظومات الالكترونية واجهزة السيطرة والتحكم باستخدام احدث برامج التصميم والمحاكاة وهي عملية لتلبية الاحتياجات المطلوبة ضمن حقل التخصص في اطار واقعي تفرض به القيود البيئية والاقتصادية والاجتماعية والسياسية والصحية .....

3د- القدرة على العمل باحدث اجهزة تشخيص الاعطال الميكانيكية والكهربائية والالكترونية لمنظومات الطائرة.

4د- القدرة على التكيف مع الاختصاصات المتشابهة (هندسة الاتصالات ,هندسة التبريد والتكييف ,الهندسة الميكانيكية, الطاقات المتجددة, ...)

13- **التخطيط للتطور الشخصي**

يتكون أعضاء الهيئة التدريسية من عدد كاف علما أن للكفاءة دور لتغطية جميع المناهج الدراسية لمجالات القسم, بالاضافة الى أن هنالك قدرة على ادارة الكلية بشكل كاف لاستيعاب مستويات من التفاعل والارشاد الطلابي وتقديم المشورة وأنشطة الخدمات الجامعية والمهنية والتنموية والتفاعل مع الممارسين الصناعيين والمهنيين فضلا عن أرباب العمل.

14- **معيار القبول (وضع الانظمة المتعلقة بالالتحاق للقسم)**

رغبة الطلبة للتقدم بالالتحاق بقسم هندسة تقنيات الكترونيات الطيران هي المعيار الرئيسي الذي سوف يؤخذ به في الكلية التقنية الهندسية-النجف من خلال ملئ استمارة اختيار القسم التي تعطى للطلبة الجدد المقبولين في الكلية علاوة على ذلك يكون معدل المتقدم للالتحاق بالقسم مأخوذا بنظر الاعتبار.

15- **أهم مصادر المعلومات**

أ- الجامعة التكنلوجية في بغداد

ب- هيئة الاعتماد الاكاديمي الامريكية ABET

ت- المعهد الأمريكي للملاحة الجوية والفضائية—AIAA

ث- منظمة مهندسين الكهرباء والالكترونيك الدولية IEEE

ج- المنظمة الدولية للطيران المدني ICAO

16- الفرص الوظيفية للخريجين:

يعمل خريجوا القسم في عدد كبير من المجالات الصناعية والخدمية في البلد وخارجه ومنها على سبيل المثال:

- شركات الطيران مثلا (الخطوط الجوية العراقية)
- مؤسسات القوة الجوية والدفاع الجوي
- هيئة الطيران المدني العراقية
- شركات صيانة الطائرات العراقية والدولية
- المطارات المحلية والدولية
- مراكز الاتصالات الارضية والفضائية

17- مدخلات القبول :

- خريجو الفرع العلمي للدراسة الاعدادية.
- خريجو قسم الطيران او الكترونيات الطيران من معاهد هيئة التعليم التقني.

18- مخرجات القبول :

مدة الدراسة في قسم هندسة تقنيات الكترونيات الطيران أربع سنوات ويمنح المتخرج درجة البكالوريوس في اختصاص هندسة تقنيات الكترونيات الطيران وبامكانه اكمال الدراسات العليا داخل وخارج القطر في اختصاص هندسة الكترونيات الطيران او التخصصات المناظرة والقريبة.

Ministry of Higher Education and Scientific Research
Al-Furat Al-Awsat Technical University
Engineering Technical College-Najaf
Techniques of Avionics Engineering Deprt.

Engineering Technical College-Najaf
Najaf City / South Street
Mobile: +9647811184744
E-mail: salim2007555@yahoo.com
Post Code: Iraq- Najaf Province-31001
P. O. Box: 226
www.atu.edu.iq

19- الكادر التدريسي :

علوم هندسة تقنيات الكترونيات الطيران مترابطة مع بعض تخصصات الهندسة الاخرى مثل :

- هندسة الكهرباء
- هندسة الالكترونيك والاتصالات
- هندسة الحاسوب
- الهندسة الميكانيكية
- هندسة التبريد والتكييف
- هندسة انتاج ومعادن
- الهندسة الكيميائية
- هندسة الفضاء
- هندسة الطاقة

ولكون الكلية التقنية الهندسية يتوفر فيها أساتذة في الاختصاصات اعلاه من ذوي المؤهلات الاكاديمية والخبرة العلمية الطويلة على الملاك الدائم فان لهم القدرة الكافية على تحقيق مخرجات البرنامج الاكاديمي بالشكل الامثل.

20- الشهادة الممنوحة:

يمنح القسم الخريجين شهادة (بكالوريوس تقني في هندسة الكترونيات الطيران).

طرائق التعلم والتعليم: المحاضرة , الورشة , المختبر , التدريس المنهجي , التدريب الصيفي
طرائق التقييم : الاختبارات الشفهية , الاختبارات التحريرية , الامتحانات الفصلية , الامتحانات النهائية , التقييم اليومي

21- الاقسام المناظرة في الجامعات العالمية:

يوجد قسم هندسة الكترونيات الطيران في عدد من الجامعات العالمية في مختلف بلدان العالم نذكر منها:

1- Avionics department/ University of Science and Technology/Pakistan (*http://www.nust.edu.pk/INSTITUTIONS/Colleges/CAE/Departments/Avionics%20Engineering%20Department/Pages/default.aspx).*

2- Program of Avionics/Southern Illinois University/USA. *(http://aviation.siu.edu/technologies/program-information/degree-specializations/avionics.php).*

3- Avionics Department/ Educational and Scientific Institute of Air Navigation/Ukraine. (*http://ian.nau.edu.ua/en/kafedra-avioniki/*)

4- Avionics Department Center/ OHIO University/USA *(https://www.ohio.edu/engineering/avionics/)*

5- Department of Avionics Engineering/Air University/Pakistan (*http://www.au.edu.pk/dept_avi_intro.aspx*).

6- Avionics department/Hindustan Institute of Technologies and Science/Indian (*http://hindustanuniv.ac.in/*).

First Years							
Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	AVTE 111	Core	Electrical Circuits Analysis (AC&DC)	3	2	5	8
2	AVTE 112	Core	Engineering Physics & Electronic	3	2	5	8
3	AVTE 131	Core	Mechanics (Statics & Dynamic)	2	0	2	4
4	CREQ 141	Secondary	Eng. Drawing & Descriptive Geometry	0	3	3	3
5	CREQ 142	Secondary	Programming I	1	2	3	4
6	CREQ 143	Secondary	Workshop	0	6	6	6
7	MATH 151	Secondary	Mathematics-I	3	0	3	6
8	UREQ 161	General	Human Right & Democracy	2	0	2	4
9	UREQ 162	General	Environment	1	0	1	-
10	UREQ 163	General	English	1	0	1	-
Total				16	15	31	43
%40The percentage of core hours =			%52The percentage of theory hours =				
%48The percentage of Secondary hours =							
%12The percentage of general hours =			%48 The percentage of practical hours =				

Second Year							
Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	AVTE 213	Core	Digital Systems - Basics & Applications Logic	2	3	5	6
2	AVTE 214	Core	Electronic Circuits & Electrical Machine	2	3	5	6
3	AVTE 215	Core	Aircrafts Structure & Aerospace Technology	2	2	4	6
4	AVTE 221	Core	Electromagnetic Field Theory	2	2	4	6
5	AVTE 232	Core	Thermodynamics of Propulsion Applied Aerodynamics-Basics	2	0	2	4
6	CREQ 245	Core	Training	-	-	-	-
7	AVTE 222	Secondary	Probability, Signals & Systems	2	2	4	6
8	MATH 252	Secondary	Mathematics II	3	0	3	6
9	CREQ 244	Secondary	Programming II	1	2	3	4
Total				16	14	30	44
%67The perce. of core hours =			% 53The perce. of theoretical hours =				
% 33 The perce. of secondary hours =			%47The perce. of practical hours =				

Third Year							
Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	6AVTE 31	Core	Microprocessors & Microcontroller	2	3	5	6
2	AVTE 317	Core	Airplane aerodynamics-Stability & Control., Avionics Navigation System.	2	2	4	6
3	AVTE 323	Core	Antenna & Transmission Lines	2	0	2	4
4	AVTE 324	Core	Analogy & Digital Communications.	2	3	5	6
5	CREQ 347	Core	Training	-	-	-	-
6	AVTE 325	Secondary	Digital Signal Processing	2	3	5	6
7	CREQ 346	Secondary	Engineering and Numerical Analysis.	3	0	3	6
8	AVTE 318	Secondary	Analog and Digital Control	2	3	5	6
9	UREQ 364	General	Air craft maintenances I	1	0	1	2
Total				16	14	30	42
%54The perce. of core hours = %43The perce. of secondary hours = The perce. of general hours = 3%				%53The perce. of theoretical hours = %47The perce. of practical hours =			

Fourth Year							
Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	AVTE 4110	Core	Avionics System Design & Instruments	2	2	4	6
2	AVTE 4111	Core	Analog& Digital Integrated Circuits FPGA-Based System Design	2	2	4	6
3	AVTE 4112	Core	Aircraft Radar and Microwave	2	2	4	6
4	AVTE 426	Core	Aircraft Data Networking	2	2	4	6
5	CREQ 448	Core	Final Project	0	6	6	6
6	AVTE 419	Core	Power Electronics	2	2	4	6
7	CREQ 449	Secondary	Industrial Engineering	2	0	2	4
8	UREQ 465	General	Air craft maintenances II	2	0	2	4
Total				14	16	30	44
The perce. of core hours = 87% The perce. of secondary hours = 7% The perce. of general hours= 6%				The perce. of theoretical hours = 47% The perce. of practical hours = 53%			

Stage	Subjects	Credit	Total H./W.	Theoretical H/W	Pract. H./W.	Core H./W.	Seco. H./W.	Gen. H./W.
First	10	45	31	16	15	13	15	4
Second	9	44	30	16	14	20	10	-
Third	9	42	30	16	14	16	13	1
Fourth	8	44	30	14	16	26	2	2
Total	**36**	**175**	**121**	**62**	**59**	**75**	**40**	**7**

Sl. No.	Code	Course Type	Course Title	L*	P*	T*	C*
1	AVTE 111	Core	Electrical Circuits Analysis (AC&DC)	3	2	5	8
2	AVTE 112	Core	Engineering Physics & Electronic	3	2	5	8
3	AVTE 131	Core	Mechanics (Statics & Dynamic)	2	0	2	6
4	CREQ 141	Secondary	Eng. Drawing & Descriptive Geometry	0	3	3	3
5	CREQ 142	Secondary	Programming I	1	2	3	4
6	CREQ 143	Secondary	Workshop	0	6	6	6
7	MATH 151	Secondary	Mathematics-I	3	0	3	6
8	UREQ 161	General	Human Right & Democracy	2	0	2	4
9	UREQ 162	General	Environment	1	0	1	-
10	UREQ 163	General	English	1	0	1	-
Total				16	15	31	45

%40The percentage of core hours =	% 52The percentage of theory hours =
%48The percentage of Secondary hours =	
%12The percentage of general hours =	%48 The percentage of practical hours =

***L is (theoretical hours), P is (practical hours), T is (total hours), C is (credit)**

Subject Number: AVTE 111
Subject : Electrical Circuits Analysis (AC&DC)
L T P C
3 0 2 8

Objective of the course:
To provide an introduction to the fundamentals of circuits analysis with emphasis on fundamental quantities and components of electricity, basic electricity laws and network theorems.

Theoretical syllabus

Week	Contents
1-2	**Introduction to D.C circuits** Elect. Quantities - Charge - Elect. Force - Conductors and insulators - Current - Elect. potential and voltage - Energy and power- Efficiency
3- 4	**Fundamentals of electrical circuits** Resistance & resistively - conductance & conductivity - Effect of temp. on resistance - Sources (voltage & current sources) - Ohms low - Circuits.
5-7	**Principles of electrical circuits** - Series circuits - Voltage divider rule - Voltage rule in the series - Parallel circuits - Current divider rule - Current source in parallel - Source transformation - Short & open circuit analysis of series-parallel networks - Kirchhoffs lows -
8 -10	**Method of analysis and network theorems** Branch current method - Mesh analysis - Nodal analysis - Star-delta and delta-star conversion - Superposition theory - Thevenins theorem - Maximum transfer theorem
11-12	**Capacitor and inductors** - Electric field - Capacitance - Capacitors in series and parallel - Faradays low - Lenzs low - Self inductance - Inductors in sires and parallel - Self inductance - Inductors in sires and parallel
13 - 14	**Magnetic circuits** - Magnetic field - Flux density - Permeability - Reluctance flux magneto motive force - Series magnetic circuits - Series-parallel magnetic circuits
15 - 17	**A.C. fundamentals** - Generation of alternating voltage and current - Equations of the alternation voltage and current - Average value - Effective(RMS) value - Series A.C. circuits - Parallel A.C. circuits - Series parallel A.C. circuits
18 - 19	**A.C. power** - Instantaneous - Average power - Complex power - Real power and reactive power - Apparent power - Power factor - Power factor correction
20 - 21	**Resonance** Series resonance - Quality factor - Selectivity - Bandwidth - Parallel resonance.
22 - 25	**3-Phase system** -3-phase generation - phase sequence - Inter connection of 3-phase - Star and delta connections - The Y-Y, Y-delta, delta-delta system - Power in 3-phase system
26 - 28	**Two-port network** Introduction - Terminal equations - Two-port parameters(z, y, h and ABCD), Equivalent circuits, Interconnected two-port.
29 - 30	**Electric transients (classical method)** The natural and forced response of series and parallel circuits - Circuits with zero and non zero initial conditions.

Practical syllabus

1	Studying the working manner in the lab, the devices using and report writing.
2	Understanding the using of AC and DC voltage measurements device, AD and DC

	current measurements devices, resistance measurements devices.
3	Ohms' Law
4	Parallel and series resistance connections
5	Star and delta connections
6	Kirchhoff laws
7	Thevenins and Norton theories
8	Superposition theory
9	Substituting theorem
10	Maximum power transfer theory
11	Oscilloscope devices, comparison between maximum, effective, and average values. Calculation the peak and r.m.s. values
12	Series RL circuit and series RC circuit
13	Parallel RL circuit and parallel RC circuit
14	Measurement of polar angle for series and parallel RLC circuits.
15	Series and parallel resonance
16	Transfer maximum power in the AC circuit
17	Power and power factor measurements using Wattmeter.
18	Enhancement of power factor
19	Voltage and current in the three phase circuits connected in star and delta
20	Time constant of RL and RC circuits

Recommended Books:

Text Books:

- Engineering Circuit Analysis by Willian Hayt & Kemmerly.

Reference Books:

- Engineering Circuit Analysis by James W. Nilsson.
- Introduction to Electric Circuits by Richard C. Dorf.

Subject Number: AVTE 112
Subject : Engineering Physics & Electronic
L T P C
3 0 2 8

Objectives of Course:
To review the fundamental concepts of physics to form basis for engineering subjects taught subsequently. In additive, the concepts of electronic are reviewed as an application of physics in electrical engineering.

Theoretical syllabus

Week	Contents
1	**Introduction to Physics** Units - Dimensional analysis - Experimental error
2 - 3	**Motion** Newton's laws of motion and their applications - Circular motion and gravitation - Work and energy - Impulse and Momentum - Rotational motion - Equilibrium of rigid body - Periodic motion.
4 - 5	**Properties of Matter** Elasticity – Types of module of elasticity – Stress-Strain diagram – Young‘s modulus of elasticity – Rigidity modulus – Bulk modulus – Factors affecting elasticity – Twisting couple on a wire – Tensional pendulum – Determination of rigidity modulus of a wire – depression of a cantilever – Young‘s modulus by cantilever – Uniform and non-uniform bending - Viscosity – Ostwald‘s viscometer – Comparison of viscosities.
6 - 7	**Acoustics and Ultrasonics** Classification of sound – Characteristics of musical sound – Intensity - loudness – Weber Fechner law – Decibel – Reverberation – Reverberation time - Derivation of Sabine‘s formula for reverberation time(Jaeger‘s method) – Absorption coefficient and its determination – Factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - Production – Magnetostriction and Piezoelectric methods – Properties – Applications of ultrasonics with particular reference to detection of flaws in metal (Non – Destructive testing NDT) – SONAR.
8 - 10	**Crystal Physics, Non- Destructive Testing, Modern Engineering Materials and Superconducting Materials** Crystal Physics: Lattice – Unit cell - Bravais lattice – Lattice planes – Miller indices – d‘ spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – coordination number – Packing factor for SC, BCC, FCC and HCP structures. Non Destructive Testing: Liquid penetrate method – Ultrasonic flaw detection – ultrasonic flaw detector (block diagram) – X-ray Radiography – Merits and Demerits of each method. Modern Engineering Materials: Metallic glasses: Preparation properties and applications. Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA. Nano Materials: Synthesis –Properties and applications. Superconducting Materials: Superconducting phenomena – Properties of superconductors – Meissner effect – Type I and Type II superconductors – High Tc superconductors (qualitative) – uses of superconductors.
11-16	**Semiconductors** Atoms, Molecules and Solids - Combination of atoms - Bonding force in solids - Si and Ge crystals and other semi conductor materials - Energy bands in solids - Direct and indirect semiconductors - Effective mass of electron and hole. Intrinsic and extrinsic semiconductors - Energy band diagrams - Fermi Dirac statistics - Dopant diffusion techniques - Critical temperature of extrinsic semiconductors - Drift of carriers - conductivity and mobility of electrons and holes - Diffusion of carriers - Diffusion and draft of carriers - P-N junction - Space charge at a junction - Avalanche Breakdown - P-

	N junction capacitance - Zener breakdown.
17-20	**Diodes** Semiconductor diodes - Special purpose diodes - Diode applications.
21-25	**Basic Transistors** Bipolar junction transistor - Transistor operation - Types of transistor -Biased transistor - Transistor biasing configurations - Common emitter - Common base - Common collector -
26-28	**Other Transistors** Field effect transistor - FET biasing techniques - common drain - common source and gate - fixed bias and self bias configurations.
29-30	MOSFET - IGFET-DMOSFET - MOSFET applications
Practical syllabus	
1	Measuring the rotation of plane of polarization of light through sugar solution
2	Studying the photo electric current as a function of intensity of light
3	Determination of the ratio of electron's charge and mass(e/m) by magnetron experiment
4	Learning how to use the electronic devices
5	The properties of diodes in forward and reveres bias
6	Half wave rectifiers
7	Full wave rectifier by bridge
8	Full wave rectifier by transform
9	Clipper circuit (positive, negative, complex)
10	Doublers DC voltage circuit (triple and quarter)
11	Zinger diode properties in forward and reverse bias
12	Using zinger diode of voltage divider with constant resistance load and changed resistance load
13	Common base transistor properties
14	Common emitter transistor properties
15	Common base amplifier (finding voltage gain and current gain)
16	Common emitter amplifier (finding voltage gain and current gain) and drawing the frequency response curve.
17	H-parameters measurements for common emitter
18	H-parameters measurements for common base
19	Using transistors in orgnizeing voltage circuits
20	Field Effect Transistor (FET) properties
21	Common source amplifier
22	Common drain amplifier
23	Light Emitting diode
24	MOSFET

Recommended Books:

Text books:

- Microelectronic Circuits by Adel S. Sedra & Kenneth C. Smith.
- University Physics by Sears & Zemansky (4th Edition).

Reference:

- Physics by Robert Renick & David Halliday.
- Circuit Analysis by John R. O'Malley.
- Electronics Circuits Discrete & Integrated by Schilling and Belove.

Subject Number: AVTE 131
Subject : Mechanics (Statics & Dynamic)
L T P C
2 1 0 4

Objectives of Course:
To understand general principles of bodies at rest and at equilibrium under the action of forces. Then, developing the ability to visualize physical configurations in terms of real materials, actual constraints and practical limitations which govern the behavior of machines and structures.

Theoretical syllabus

Week	Contents
1	**Introduction to Statics**
2 - 5	**Vectors- Forces - Force in 3D - Moments - Couples - Resultant**
6-9	**Equilibrium - Planes Trusses - Joint Method - Section Method - Trusses in 3D**
10-11	**Frames and Machines - Friction - Wedges and Screws - Belts**
12	**Application of friction on bearings**
13-15	**Centered of line , area and volume - Moment of inertia - Theory of parallel axes - Problems**
16	**Rectilinear motion**
17	**Curvilinear motion** -x-y coordinates -Normal – Tangential coordinates -Polar – coordinates
18	**Relative motion** -Motion relative to a frame in translation
19	**Kinetics of particles** -Newton's 2nd law - Rectilinear motion - Curvilinear motion
20	**Work and energy of particles** -Work of a force
21	**Impulse and momentum of particles** -Impulsive motion -Angular momentum of a particle
22	**Conservation of liner momentum** -Liner impact
23	**Conservation of momentum** -Conservation of angular momentum -Impact - Impulse and momentum of particles
24	**Angular momentum** -Rate of changed of angular momentum -Conservation of angular momentum
25	**Kinematics of rigid bodies** -Translation of rigid bodies -Rotation of rigid bodies
26	**Absolute motion** -General motion -Absolute and relative velocity in plane motion -Instantaneous center of rotation -Absolute and relative acceleration
27	**Moment of inertia** -Mass moment of inertia
28	**Force/mass/acceleration** -Force/mass/acceleration for rigid bodies
29	**Work and energy** -Work for rigid bodies -Energy for rigid bodies
30	**Impulse and momentum** -Impulse for rigid bodies -Momentum for rigid bodies

Recommended Books:

Text Books:

- Engineering Mechanics by J L Meriam and L.G. Kraige.

- Engineering Mechanics (Dynamics) by J.L. Meriam & G Kraige.

Reference Books:

- Engineering Mechanics by Irving H. Shames.
- Engineering Mechanics (dynamics) by R. C. Hibbeler
- Engineering Mechanics by Higdon and Stiles.

Subject Number: CREQ 141
Subject : Eng. Drawing &Descriptive Geometry
L T P C
0 0 3 3

Specific Objectives of course:
To introduce basic concepts of engineering drawing with emphasis on orthographic drawings, drafting principles and practices.

Week	Contents
1	**Introduction to engineering drawing and eng. drawing equipment** - Introduction to engineering drawing and its importance to the engineer - History of eng. drawing - The standard drawing equipment
2	**Lettering** - The lettering and circles kind - The paper type and design with title table - Draw eng. Lines type and circles
3 - 5	**Applied geometry** - Applied geometry in eng. Drawing - Draw important eng. geometry - Exercise in engineering geometry - Exercise in engineering geometry
6 - 8	**Pictorial drawing (Real model in true dimension)** - Draw cube shape with ovals by used four center method. - Non standard letters - Exercise in pictorial drawing - Exercise in pictorial drawing
9	**Orthographic projection** - Projection theory with definition standard planes (Horizontal and Vertical) - Exercise in projection
10	**First angle projection** - Three projection definition (front, top and side view) - Draw in first angle - Exercise in projection
11 - 12	**Dimensions** - Main rules in dimensions position and details in drawing - Exercise in applied dimension on projection view - Rules in dimension position for arcs and circles - Exercise in applied dimension on projection view
13 - 14	**Orthographic** - Exercise in projection - Exercise in projection
15 - 19	**Sections** - Sections definition - Find sections and section planes and half section projection - Exercise in sections - Exercise in sections - Exercise in sections - Exercise in sections - Exercise in sections
20 - 24	**Third view estimate** - Important steps to estimate third unknown projection depending on the known two projection - Estimate real model - Exercise in estimate third unknown projection - Exercise in estimate third unknown projection - Exercise in estimate third unknown projection - Exercise in estimate third unknown projection - Exercise in estimate third unknown projection
CAD I -	
Week	**Contents**
1	**Introduction to CAD packages** - Menus - Tool bars
2	**Drawing area** - Command window / Command line - Status bar
3 - 6	**Coordinate system (absolute and relative Coordinate)** - Cartesian - Cylindrical - Spherical - Setting up drawing limits

7 - 8	**Two dimensional drawing** - Drawing bar (line, circle, rectangle, …etc) - Modify bar (erase, copy, mirror,…etc
9 - 12	**Drawing aids** - Grid - Snap mode - Object snap - Object snap tracking - Orthogonal mode - Polar tracking
Descriptive Geometry	
Week	**Contents**
1 - 2	**Descriptive geometry** - Descriptive geometry and methods of projection - Descriptive geometry and methods of projection
3 - 6	**Projection of point** - Projection of point - Exercise in projection of point - Exercise in projection of point - Projection of straight line - Exercise in projection of straight line - Exercise in projection of straight line
7 - 8	**Auxiliary planes** - Auxiliary planes - Exercise in auxiliary planes - Exercise in auxiliary planes
9 - 10	**Applications** - Exercise in projection of straight line by rotation method - Exercise in projection of straight line by rotation method
11 - 12	**Development of surface** - Introduction and describe development of surface - Exercise in projection triangular shape - Exercise in projection triangular shape

Recommended Books:

- Fundamentals of Engineering Drawing by French & Vierck.
- Getting started with Sold Edge. Version 12, by Unigraphics Solution Inc.
- Fundamentals of drafting with AutoCAD LT by Paul Wallach, Dean Chowenhill & James Cullen.

Subject Number: CREQ 142
Subject : Programming I
L T P C
1 0 2 4

Objective of Course:
Introduction and familiarization with the working and understanding of computer and its use/applications in various engineering subjects in particular and society in general.

Theoretical syllabus

Week	Contents
1-6	**Computer Fundamentals** Introduction – Evolution of Computers – Generations of Computer – Classification of Computers – Application of Computers - Components of a Computer System – Hardware - Software - Starting a Computer (Booting) – Number Systems.
7-13	**Computer Programming and Languages** Introduction - Problem-Solving Techniques: Algorithms, Flowchart, Pseudocode - Program Control Structures – Programming Paradigms – Programming languages – Generations of Programming Languages – Language Translators – Features of a Good Programming Languages
14-16	**Programming With C** Introduction to C - Arrays Definition - Declaration and initialization of one dimensional array - Accessing array elements - Displaying array elements - Sorting arrays - Arrays and function - Two-Dimensional array - Declaration and Initialization - Accessing and Displaying - Memory representation of array [Row Major, Column Major] - Multidimensional array.
17-18	**Pointers** Definition and declaration - Initialization - Indirection operator - Address of operator - Pointer arithmetic - Dynamic memory allocation - Arrays and pointers - Function and pointers
19-21	**Strings** Definition - declaration and initialization of strings - standard library function: strlen(), strcpy(), strcat(), strcmp() - Implementation without using standard library functions.
22-24	**Structures** Definition and declaration - Variables initialization - Accessing fields and structure operations - Nested structures Union: Definition and declaration - Differentiate between Union and structure.
25-27	**Introduction C Preprocessor** Definition of Preprocessor - Macro substitution directives - File inclusion directives - Conditional compilation **Bitwise Operators** Bitwise operators - Shift operators - Masks - Bit field
28-30	**File handling** Definition of Files - Opening modes of files - Standard function: fopen(), fclose(), feof(), fseek(), fewind() - Using text files: fgetc(), fputc(), fscanf()

Practical syllabus

1-5	Internal command (Dir - Del - Time - Date - Cls - RD- CD - MD - Echo - Prompt - Ren - Copy - Vol - Ver - Path) External Command (Edit - tree - xcopy - format - chkdsk - Diskopy).
5-10	Windows
11-13	standard library function: strlen(), strcpy(), strcat(), strcmp() - Implementation without using standard library functions.
14-15	Variables initialization - Accessing fields and structure operations - Nested structures -
16-17	Union: Definition and declaration - Differentiate between Union and structure.
18-19	Macro substitution directives - File inclusion directives - Conditional compilation

20-21	Bitwise operators - Shift operators - Masks - Bit field
22-24	Opening modes of files - Standard function: fopen(), fclose(), feof(), fseek(), fewind()
25-26	Using text files: fgetc(), fputc(), fscanf()

Recommended Books:

Text Book:

- Computer Programming, by ITL Education Solution Limited, Ashok Kamthane, Pearson Education Inc 2007 (Unit: I to V).

References:

- Programming with C, by Byron S. Gottfried, Second Edition, Tata McGraw Hill 2006.
- Programming in C - A Complete introduction to the C programming language, by Stephen G.Kochan, Pearson Education, 2008.
- Computer Programming Theory and Practice, by T.JeyaPoovan, Vikas Pub, New Delhi.

Subject Number: CREQ 143
Subject : Workshop
L T P C
0 0 6 6

Objectives of Course:
To introduce students different workshops types (electronics and mechanics) workshops, tools used in each workshop, and manufacturing techniques of different workshops.

Mechanics (6 hours)	
Week	**Contents**
1-4	**Occupational Safety**
5-9	**Foundry Workshop**
10-14	**Files type Workshop**
15-19	**Carpentry Workshop**
20-25	**Turnery workshop**
26-30	**Welding types Workshop**

Electronics (6 hours)	
Week	**Contents**
1	Learn how to use different measuring devices in the workshop
2	Learn how to use caustic, types of caustic, welding by using caustic
3	Types of welding, Auxiliary materials for welding, wires welding between them and with other components.
4	Sucker solder and Solder removal, Training to remove some of the electronic components of the printed board
5-6	Learn different types of printing board through printing method, drilling operation, Install the various components.
7-9	Different types of electronics components through manufacturing for example the resistance and its power, measure the value of resistance in different methods, rheostat
10-12	Parallel resistance circuit - series resistance circuit - parallel and series resistance circuits - and check it.
13	Types of capacitance
14-15	Parallel capacitance circuit - series capacitance circuit - parallel and series capacitance circuit - check it on the board.
16	Switch types
17	Fuses types
18	Inductor types
19	Transformer types
20-22	Semi conductor (diode -transistor, ….) through manufacturing, material used in its manufactured, its numbering methods, its equivalent circuits, checking, determination the faults
23-26	Electrical installation
27	Integrated circuit
28	Caustic used in integrated circuit welding
29	Learn how to read electronic board
30	Students learn to design electronic board on the printed board, install the component on the board, and welding the components on the board.

Subject Number: MATH 151
Subject : Mathematics - I
L T P C
3 0 0 6

Objectives of The Course:
To provide comprehensive foundation of applied algebra and calculus with emphasis on vectors, complex numbers, matrices, limits, differentiation, integration, and coordinate systems.

Week	Details
1	**General Concepts, Slope** - Cartesian Coordinates - Slope of a line - Equations and distances
2	**Graphing of functions, Limits** - Graphs of equations - Limits and intervals
3	**Continuity** - Domain and Range - Continuity test
4-7	**MATRICES** Review: Basic concepts of matrices-addition, subtraction, multiplication of matrices – adjoint –inverse – solving cubic equations. Characteristic equation – Properties of Eigen values – Eigen values and Eigen vectors – Cayley Hamilton theorem (without proof) – Verification and inverse using Cayley Hamilton theorem. Diagonalisation of matrices – Orthogonal matrices– Quadratic form – Reduction of symmetric matrices to a Canonical form using orthogonal transformation – Nature of quadratic form.
7-8	**Complex Numbers** - Introduction to complex numbers - Argrand diagrams and product quotients
9	**Demaiver's Theorem** - Powers and roots
10-11	**Trigonometric and inverse trigonometric functions** - Trigonometric functions- Properties- Rules- Graphing- Applications- Rules- Properties
12	**Logarithmic and exponential functions** - Logarithmic and exponential functions - Properties - Rules
13-14	**Hyperbolic and inverse hyperbolic functions** - Graphing- Properties- Rules- Properties- Rules- Graphing
15-19	**Derivatives of functions (logarithmic, exponential, trigonometric, hyperbolic functions) and its applications:** - Rules of derivatives- Chain rule- Implicit derivatives- Rules of derivatives of logarithmic and exponential functions- Derivatives of trigonometric and inverse trigonometric functions- Derivatives of hyperbolic and Inverse hyperbolic functions- L'Hapital rule- Velocity and acceleration- Max. and Min. - Point of inflection
20-22	**Indefinite Integrals** - Integration formulas- Integration of logarithmic and exponential functions- Trigonometric and inverse trigonometric functions
23	**Methods of Integration** - Integration by parts- Integration for odd and even powers of sine and cosine
24	**Integration of Trigonometric** Substitutions - Trigonometric Substitutions - Integral involving a x2 + b x + c
25	**Integration of Partial fractions and Rational functions** - Partial fractions - Rational functions of sinx and cosx and other trigonometric functions
26	**Applications of Integration** - Definite integral and area

27	**General Substitutions** - Length of the curve and surface area
28	**Triple Integrals (volume)** - Triple Integrals (volume)
29	**Double Integrals** - Area between two curves
30	**General Substitutions and quiz** - Quiz, answers and solutions

Recommended Books:

Text Books:

- Calculus and Analytic Geometry by Thomas.
- Advanced Engineering Mathematics by Kreyszig.

Reference Books:

- Analytic Geometry and calculus with Vectors by Agnew.
- Practical Mathematics Vol-I & II by Toft & Mckay.
- Advanced Calculus for Application by Hildebrand.
- Vector Calculus by Bedford F W & Dwivedi.

Subject Number: UREQ 161
Subject : Human Right & Democracy
L T P C
2 0 0 4

Objective of course:
To study the laws and principle of the human right & democracy from the perspective of Islamic religion and other religions.

Week	Contents
1	**Freedom & Democracy** - An introduction to freedom and democracy in multiple societies and on different ages, its types and how changes in regime occurred
2	**Relativity in freedom** - Freedom is not an absolute idea but it is variable with respect to time, place regime…etc.
3	**General Freedom guaranties** - Freedom has political and legal guaranties.
4	**General freedom divisions** - Natural freedoms, private freedoms, intellectual freedoms, collective freedoms and political freedoms
5	**Individual Freedoms** - Opinion freedom, expression freedom, press freedom…etc.
6	**Democracy & political systems** - Overview about democracy and its history
7	**Democracy types** - Direct and indirect
8	**Dictatorship and its specification** - Overview and specification
9	**Concepts about democracy** - Traditional meaning and modern meaning.
10	**Democracy in Greek Civilization VS. Current democracy**
11	**Current crisis of democracy** - Economical, social, cultural and political difficulties
12	**Civil & political rights** - Which includes life right, personal freedom, possessing, contracting family…etc.
13	**Individual importance and its relation with nation and regime**
14	**Importance and specifications of sovereignty**
15	**Main portions of a country** - People, land, government and sovereignty
16	**Human rights in human history** - Human rights in ancient ages like Mesopotamian, Greek, and Roman civilizations
17	**Human rights in divine religions** - In Christian and Islamic
18	**Human rights** - Overview, properties and types
19	**International confession of human rights**
20	**Territorial confession of human rights** - international and legal resources from international agreements
21	**NGO and its role in the protection of human rights**
22	**Women rights** - In Islamic time
23	**Children Rights** - In old civilizations - In divine religions - In international agreement on 1989

24	**Elections and human rights** - Human rights is a concept of free elections
25	**Human rights resources in Iraq** - Basics of human rights in Iraq from the Iraqi constitution, year 2005
26	**Legal resources for human rights** - All national legal and foreign legal
27	**Human rights resources** - In United Kingdom, France and USA
28	**Civil Rights** - Equality, life freedom rights and house and personal privacy
29	**Political & economical rights** - Election rights government critique
30	**Social & cultural rights** - This includes the right of family creation, social and health care, and the right of clean environment

Subject Number: UREQ 162
Subject : Environment
L T P C
1 0 0 0

Objective of course:

Week	Contents
1	تعريف البيئة وعناصرها وعلم البيئة والتنبؤ
2	المحيط والتنوع البايولوجي
3-4	المنظومة البيئية ومكوناتها البيئة وعلاقتها بالانسان
5-6	التلوث البيئي ومستوياته وانواعه تلوث الهواء وانواع ملوثاته
6-8	مصادر تلوث الهواء ومخاطره علاقة التلوث بالمتغيرات المناخية والاحتباس الحراري
9-10	اسباب تلوث المياه ومخاطره
11-12	اسباب ومخاطر تلوث التربة
13-14	التلوث الاشعاعي التلوث بالضوضاء واثاره
15	الثلوث البصري والضوئي والداخلي
16-17	سبل معالجة التلوث البيئي والحد منه التخطيط البيئي والتنمية المستدامة
18	الطاقات الجديدة والمتجددة
19-20	الاتفاقيات والمعاهدات ودورها في الحفاظ على البيئة وحمايتها اتفاقية كيوتو ورامسار
21-23	بعض التشريعات البيئية العربية والدولية قانون حماية البيئة العراقي
24	مؤسسات الدولة والمواطن ومنظمات المجتمع المدني ودورها في الحفاظ على البيئة
25-27	دور الاديان في المحافظة على البيئة وحمايتها تعليمات وارشادات في المحافظة على البيئة وحمايتها
28-30	دروس وتصائح في حب البيئة والحفاظ عليها ومنع تلوثها

1- زينب منصور, المعجم البيئي, دار اسامة للنشر والتوزيع , الطبعة الاولى , الاردن, عمان , 2011.

2- Cunningham W. P., Cunningham M. A., Saigo B. W., Environmental science A Global Concern, 9th Edition, McGraw-Hill, New York, 2007.

Subject Number: UREQ 163
Subject : English
L T P C
1 0 0 0

Objective of course:

Week	Contents
1-4	**Basics of Grammar** **Parts of speech and use of articles** **Sentence structure, active and passive voice** **Practice in unified sentence** **Analysis of phrase, clause and sentence structure** **Transitive and intransitive verbs** **Punctuation and spelling**
5	**Comprehension** Answers to questions on a given text
6-7	**Discussion** General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)
8-10	**Listening** To be improved by showing documentaries/films carefully selected by subject teachers
11-12	**Translation skills** Urdu to English
13-15	**Paragraph writing** Topics to be chosen at the discretion of the teacher
16-18	**Paragraph writing** Practice in writing a good, unified and coherent paragraph
19	**Essay writing** Introduction
20-21	**CV and job application**
22-24	**Translation skills** Urdu to English
25-26	**Study skills** Skimming and scanning, intensive and extensive, and speed reading, summary and précis writing and comprehension
27-28	**Academic skills** Letter/memo writing, minutes of meetings, use of library and internet
29-30	**Presentation skills** Personality development (emphasis on content, style and pronunciation

Recommended books:

Functional English

a) Grammar

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
2. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 019431350661

b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.

c) Reading/Comprehension

1. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

Communication Skills

a) Grammar

1. Practical English Grammar by A.J. Thomson and A.V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19431350 6.62

b) Writing

1. Writing. Intermediate by Marie-Chrisitine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).

c) Reading

1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
2. Reading and Study Skills by John Langan
3. Study Skills by Riachard Yorky.

Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	AVTE 213	Core	Digital Systems - Basics & Applications Logic	2	3	5	6
2	AVTE 214	Core	Electronic Circuits & Electrical Machine	2	3	5	6
3	AVTE 215	Core	Aircrafts Structure & Aerospace Technology	2	2	4	6
4	AVTE 221	Core	Electromagnetic Field Theory	2	2	4	6
5	AVTE 232	Core	Thermodynamics of Propulsion Applied Aerodynamics-Basics	2	0	2	4
6	CREQ 245	Core	Training	-	-	-	-
7	AVTE 222	Secondary	Probability, Signals & Systems	2	2	4	6
8	MATH 252	Secondary	Mathematics II	3	0	3	6
9	CREQ 244	Secondary	Programming II	1	2	3	4
Total				16	14	30	44

%67The perce. of core hours =	% 53The perce. of theoretical hours =
% 33 The perce. of secondary hours =	%47The perce. of practical hours =

Subject Number: AVTE 213
Subject : Digital Systems - Basics & Applications Logic
L T P C
2 0 3 6

Objective of the course:
To provide an introduction to the fundamentals of logic, truth table, & understanding the logic circuits and systems. In additive, analysis and design the simple logic circuits.

Theoretical syllabus

Week	Contents
1-2	**Number systems** binary - decimal - octal and hexadecimal number systems - conversion between number systems - binary codes - arithmetic operation of binary system.
3-5	**Logic gates, Boolean Algebra & Simplification of logic circuits** logic gates - logic circuit - logic equation and truth table (product of sum and sum of product) - simplification of logic circuit (Boolean algebra and Karnugh maps) - two, three, four variable K-map - don't care conditions - Demorkan s laws - NAND, NAND network - Binary codes
6-7	**Arithmatic Logic Circuits** Half & Full adder - Half & Full subtractor - Serial and parallel binary adders - (1'S and 2'S) complements circuit - BCD adder - comparator circuits.
8-9	**Multivibrators** RS flip flop - clocked RS flip flop - D flip flop - T flip flop - JK flip flop - master/slave flip flop.
10 - 12	**Counters** Asynchronous counter - design of asynchronous counters - synchronous counters - design of synchronous counters. Examples: 4bits counter - (Up-down) counter - Ripple counter - (Mod-10) counter - Counter applications.
13-14	**Registers** Serial shift register - Parallel shift register - Ring counter - Static and dynamic registers - Johnson counter
15-16	**Multiplexer, Dmultiplexer, Decoder, Encoder**
17-18	**Test of logic circuit - Fault model - Path Sensitizing - Random test - Test of sequential circuit.**
19-22	**Synchronous sequential circuit** Basic design steps - Mealy state model - Serial adder example - Design of counter using sequential circuit.
23-26	**Asynchronous sequential circuit** Analysis of asynchronous circuit - Synthesis of asynchronous circuit - State reduction - State assignment - Hazard
27-28	**555 Timer** 555 Architecture - Astable circuit design - Mono stable circuit design.
29-30	**Convertors** D/A and A/D converter - Types of D/A - Types of A/D - D/A accuracy and resolution

Practical syllabus

1	logic gates (AND,OR, & NOT) using diodes , transistor ,& resistors.
2	Implement logic gates (AND,OR, NOT, AND, NOR, XOR &XNOR)
3	logic gates (AND,OR, NOT,NAND,NOR, XOR, &XNOR) by using integrated circuits IC{7408, 7432, 7404, 7400, 7402, 7486 ,&74266}
4	Boolean's algebraic
5	Demorgan's theorem
6	Implement logic gates (AND,OR, NOT, NAND, NOR, XOR &XNOR) using NAND &

	NOR gates only
7	1bit comparator - 2bits comparator - 3bits comparator
8	Half adder - Half subtract - Full adder - Full subtract
9	2-bits multiplication circuit
10	Coding circuit from BCD to Cray code
11	SR flip flop - JK flip flop -D flip flop -T flip flop -
12	Serial counter (Asynchronies counter) A-Up counter , B-Down counter
13	Parallel counter (Synchronies counter)
14	Johnson & ring counter
15	Decade counter
16	Shift register A- Shift right register (SRR) , B- Shift left register (SLR)
17	Sequence detector
18	Compound counter
19	Multiplexer: A-4x1 multiplexer using logic gates, B-8x1 multiplexer using IC 74151
20	Decoder 2x4 using logic gates
21	Serial adder example - Design of counter using sequential circuit
22	Synthesis of asynchronous circuit
23	State reduction - State assignment
24	Hazard
25	555timer (Astable circuit design - Mono stable circuit design)
26	Parity checker
27	Digital to analog converter (D/C)
28	Analog to digital convertor (A/D)

Recommended Books:

- Digital principles and applications, by Albert Paul Malvino, 2nd Edition.
- Digital Logic Circuits by D.A.Godse A.P.Godse, Technical Publications 2008.

Subject Number: AVTE 214
Subject : Electronic Circuits & Electrical Machine
L T P C
2 0 3 6
Objective of the course:
To learn the student analysis and design of operational amplifier, power amplifier, and oscillators. In additive, studying electrical machine in two parts motors and genertors.

Theoretical syllabus

Week	Contents
1-3	**Operational Amplifiers** The basic operational amplifier - The D coupled differential amplifier - Transfer characteristics of a differential offset error voltage and currents - Measurement of operational amplifier parameters - Frequency response of operational amplifiers.
4-6	**Linear analog system** Basic operational amplifier applications - Differential DC amplifiers analog integrator and differential active filters integrated circuit tuned amplifier - A cascade audio amplifier comparators sample and hold circuits precision AC/DC convertors logarithmic amplifiers - Waveform generators generative comparator (Schmitt trigger).
7-10	**Power amplifiers** Class A large-signal amplifiers second harmonic distortion - Higher order harmonic generation - The transformer coupled audio power amplifier efficiency - Push pull amplifier class B amplifier - Class AB - Regulated power supply series voltage regulator.
11-13	**Feedback amplifiers** The feedback concept - The transfer gain with feedback characteristics of negative feedback amplifiers - Input resistance - Output resistance - Method of analysis of a feedback amplifier - Voltage-series feedback - A voltage series feedback pair - Current series feedback - Current shunt feedback - Voltage shunt feedback.
14-15	**Oscillators:-** Type of oscillators - Oscillators pairs -The Hartley oscillators - The Colpitt oscillators - The ultra audio oscillators - Crystal oscillators - Crystal and temperature coefficients - crystal heater chambers - Crystal holders - Other crystal circuits - Some high frequency oscillators - Audio oscillators - Dynatron oscillators - RC oscillators - Parasitic oscillators - Indication of oscillators - Oscillators stability.
16-17	**Introduction** Introduction to electrical machines - Classification of electrical machines - Construction of rotating machines.
18	**DC machine construction:** EMF equation - Torque and speed equations of DC machine. DC generators (classification of DC generators and characteristic curves for each type).
19-20	**Losses and Efficiency of DC generators:** DC Motors (classification of DC motors and characteristic curves for each type) - Speed control of DC motors - Starting of DC motors - Testing of DC machines - Uses of DC motors.
20-21	**Transformers:** (Basic principle, construction of single phase transformer, and EMF equation) - Transformer Equivalent Circuit - Tests on transformers - Losses and Efficiency - Current and voltage transformers - Auto transformer - 3-phase power transformers.
22-23	**Three phase induction motors:** (construction, theory of rotating magnetic field, speed and slip) - Equivalent circuit of 3-phase IM, Torque – slip, and torque speed characteristics. Tests on IM - Losses - Power stages and Efficiency - Starting and speed control of 3-phase IM, .
24-25	**Single phase motors:** (classification , methods of rotating field production) - Equivalent circuit of single phase

	IM. Tests on single phase IM - Losses and Efficiency.
26-27	**Synchronous Machines:** (general theory and construction) - Alternator equivalent circuit - voltage equation - Phasor diagram - and voltage regulation. Load characteristic of alternator - Input and output power equations.
28-29	**Synchronous Motors;** (principle of operation and phasor diagram) - Load characteristic of synchronous motor - Input and output power equations - Max. output power. Torque equation - Methods of starting - Applications of synchronous Motors.
30	**Special Purpose Motors:** Linear motors - Stepper motors. DC Servomotors and AC Servomotors. Conversion from AC to DC.

Practical Syllabus

1	Inverter amplifier circuit by operational amplifier
2	Non-inverter amplifier circuit by operational amplifier
3	Summation amplifier circuit by operational amplifier
4	Subtract or amplifier circuit by operational amplifier
5	Integrator amplifier circuit by operational amplifier
6	Differential amplifier circuit by operational amplifier
7	Half wave rectifier circuit by operational amplifier
8	Full wave rectifier circuit by operational amplifier
9	Compactor circuit by operational amplifier
10	Smith trigger circuit
11	Logarithmic amplifier circuit
12	Low pass filter circuit by operational amplifier
13	High pass filter circuit by operational amplifier
14	Square wave generator circuit by operational amplifier
15	Triangle wave generator circuit by operational amplifier
16	Introduction to Industrial safety and security principles
17	Magnetizing curve for separately excited and self excited generators.
18	EMF vs. speed curve for separately excited DC generator and find out the critical resistance.
19	EMF vs. speed curve for shunt DC generator and find out the critical resistance.
20	Load, internal and external characteristic curves for separately excited DC generator.
21	Load, internal and external characteristic curves for shunt DC generator.
22	Load, internal and external characteristic curves for series DC generator.
23	Load, internal and external characteristic curves for compound (cumulative and differential) DC generator.
24	Parallel operation of two separately excited DC generators.
25	Load characteristic, torque curve, and efficiency for DC series motor.
26	Load characteristic, torque curve, and efficiency for DC shunt motor.
27	Speed control for DC shunt motor (Supply voltage and Field current control)
28	Losses and Efficiency calculation for DC machine.
29	Open circuit and Short circuit Tests on single phase transformer.
30	Load Test on single phase transformer.

Recommended Books:

Text Books:

- Engineering Circuit Analysis by Willian Hayt & Kemmerly.
- Electric Machinery Fundamentals (3rd Edition) by Stephen J. Chapman.

Reference

- Engineering Circuit Analysis by James W. Nilsson.
- Introduction to Electric Circuits by Richard C. Dorf.

- Electric Machines: Theory, Operation, Applications, Adjustment and Control by Charles Hubert.

Subject Number: AVTE 215
Subject : Aircrafts Structure & Aerospace Technology
L T P C
2 0 2 6
Objective of course:
To provide understanding, analysis and design simple aircraft structural components and its system to the engineering students.

Theoretical syllabus

Week	Contents
1-2	**Flight controls** which dealing with aerodynamics and aircraft control surfaces.
3-5	**Aircraft construction** Basic structure of aircraft - Landing gears - Hydraulic - Pneumatic and fuel systems
6-7	**Principle of jet reaction** Thrust and power - factors effecting thrust - Compressors and jet propulsion devices
8-9	**Aircraft instruments** Flight - Engine auxiliary instruments.
10	**Electrical system** Power supply - Power generation - Electrical components.
11-12	**Armament systems study** Aircraft ejection system - Fundamentals of bombs and firearms - Principle and construction of ammunition and explosives .
13-15	**Statically determinate structures** Analysis of plane truss – Method of joints – 3 D Truss - Plane frames
16-19	**Statically indeterminate structures** Composite beam - Clapeyron‘s Three Moment Equation - Moment Distribution Method.
20-23	**Energy methods** Strain Energy due to axial, bending and Torsional loads – Castigliano‘s theorem - Maxwell‘s Reciprocal theorem, Unit load method - application to beams, trusses, frames, rings, etc.
24-27	**Columns** Columns with various end conditions – Euler‘s Column curve – Rankine‘s formula - Column with initial curvature - Eccentric loading – South well plot – Beam column.
28-30	**Failure theory** Maximum Stress theory – Maximum Strain Theory – Maximum Shear Stress Theory – Distortion Theory – Maximum Strain energy theory – Application to aircraft Structural problems

Practical syllabus

1	Determination of Young‘s modulus of steel using mechanical extensometers.
2	Determination of Young‘s modulus of aluminium using electrical extensometers
3	Determination of fracture strength and fracture pattern of ductile materials
4	Determination of fracture strength and fracture pattern of brittle materials
5	Stress Strain curve for various engineering materials.
6	Deflection of beams with various end conditions.
7	Verification of Maxwell‘s Reciprocal theorem & principle of superposition
8	Column – Testing
9	South – well‘s plot.
10	Riveted Joints.

- Direct & Alternating Current Machinery by Rosenblatt and Friedman.

Recommended Books:

Subject Number: AVTE221
Subject : Electromagnetic Field Theory
L T P C
2 0 2 6

Specific Objectives of course:
To introduce fundamentals of electromagnetic field theory for understanding and analyzing electromagnetic phenomenon.

Week	Contents
1-4	**Vector Analysis:** Scalars And Vectors - Vector Algebra - The Cartesian Coordinate System - Vector Component And Unit Vectors - The Vector Field - Dot Product - Cross Product - Cylindrical Coordinate - Spherical Coordinate - Transformation Between Coordinates -

Text Books:

- Analysis of Aircraft Structures – An Introduction‖, by Donaldson, B.K. McGraw-Hill, 1993.

Reference

- Strength of Materials, by Timoshenko, S. Vol. I and II, Princeton D. Von Nostrand Co, 1990

	Del Operator - Laplacian Operator - Gradient - Divergence and Curl - Null Identities.
5-6	**Coulomb law** Electric field intensity - Field due to continuous volume charge - Field of line charge - Field of sheet charge.
7-10	**Electrostatics** Electric Flux Density - Gauss Law - Application of Gauss Law - Maxwell First Equation.
11-14	Energy and Potentials in A Moving Point Charge in An Electric Field - The Line Integral - Definition of Potential Difference and Potential - The Potential Field of A Point Charge - Conservative Property - Potential Gradient - The Dipole - Energy Density in The Electric Field.
15-18	Conductors - Dielectric and Capacitance - Current and Current Density - Continuity of Current - Metallic Conductor - Boundary Conditions - Image Theory - Semiconductor - Dielectric Materials - Capacitance - Example of Capacitance.
19	Pisson and Laplace Equations.
20-23	The Steady Magnetic Field - Biot-Savar Law - Amperes Circuital Law - Magnetic Flux and Magnetic Flux Density - The Scalar and Vector Magnetic Potentials - Derivation of The Steady Magnetic Field Law.
24-26	Time varying fields and Maxwell equations - Faraday law - Displacement current - Maxwell equations in point form - Maxwell equation in integral form - The retarded potentials.
27-30	The Uniform Plane Wave - Wave Equation - Wave Propagation in Free Space - Wave Propagation in Dielectric - The Poynting Vector And Power Consideration - Propagation in Good Conductors - Skin Effect - Wave Polarization.

Recommended Books:

Text Books

- Elements of Electromagnetic by Matthew N.O. Sadiku (2nd Edition).

References

- Field and Wave Electromagnetic by David K. Cheng (2nd Edition).
- Engineering Electromagnetic by William H. Hayt (2nd Edition).
- Electronic communication System by George Kennedy (2nd Edition).
- Electromagnetic Waves and Radiating System by Balma.

Subject Number: AVTE232
Subject : Thermodynamics of Propulsion & Applied Aerodynamics-Basics
L T P C
2 0 0 4

Objectives of Course:
To understand and develop the essential background and know how of thermodynamics. In additive introducing aerodynamics to Avionics Engineering students.

Week	Contents
1	Zeroth law
2-6	First law and its applications to various systems - Physical properties of pure substances - Use of property tables - PVT relations - Equations of state for ideal gases.
7-10	Second law and its results - reversible and irreversible processes and cycles - Concept of entropy and its uses.
11-12	Applications of the concepts are focused on the Closed Thermodynamics System.
13-15	An introduction to the Open Systems and their applications.
16-22	Definitions and concepts related to the hydrostatics equation and Standard Atmosphere - incompressible and compressible flows and application of continuity - momentum and energy equations in their simplified forms.
23-30	Introduction to wind tunnel design and compressibility effects in aerodynamics flows

Recommended Books:

Text Books:

- Engineering Thermodynamics, An introduction Textbook by J. B. Jones/G. A. Hawkins, second edition, John Wiley & Sons Inc, 1986.
- Introduction to Flight by J. D. Anderson, Jr. (2^{nd}/3^{rd}).

Reference:

- Thermodynamics by Kenneth Wark.
- Applied Thermodynamics by T D Estop/Mckonkey.
- Gas Dynamics by E. A. John.
- Fundamentals of Aerodynamics by J. D. Anderson, Jr(2^{nd} Ed.)

Subject Number: AVTE325
Subject : Probability, Signals & Systems
L T P C
2 0 2 6

Objective of Course:
To develop understanding of fundamentals of probability including various probability distributions and laws of statistics and elementary statistical techniques to effectively analyze scientific data.

Week	Contents
1-2	**Introduction:** Set Theory - Basic concepts of probability
3-4	**Probability types:** Conditional probability - Independent events -
5	**Baye's formula**
6-7	**Discrete and continuous random variables - Distributions and density functions**
8-9	Probability distributions (binomial, Poisson, Hyper geometric, Normal, Uniform and exponential)
10-15	**Mean - Variance - Standard deviations - Moments and generation functions - Linear regression and curve fitting - Limits theorems - Stochastic processes - First and second order characteristics - Applications**
16-23	**Signals, spectrum, and filters** Singularity functions - Periodic signals and Fourier series - Non periodic signals and Fourier transform - Convolution and impulses system response and filters - Correlation and spectral density - Parseval's theorem for energy signals. Laplace Transform - Z-Transform - Analysis of signals and System.
24-27	**Ideal & practical filters:** LPF(RC & RL) - HPF(RC &RL) - BPF - BSF.
28-30	**Noise** Band limited white noise - Thermal noise - Noise figure.
	Practical Syllabus
16-17	Analysis of signals
18-20	Periodicity of the signals
21-23	Demonstration of Convulsion
24	Signal sampling using different parameters
25-26	Filter design
27	Calibration of voltage controlled oscillator
28	RF radio amplifier with tuning circuit
29-30	Equalizer effects on the radio amplifier operation

Recommended Books:

Text Books:

- Introduction to Statistics by Walpole

Reference

- Modern Elementary Statistics by John E. Freund.
- Probability and its engineering uses by T.C.Fry.
- Elementary Statistics by P. A. Games & G. R. Klaro.
- Probability and Statistics by Nestollor, Rourke and Thomas.
- Introduction to Signals and Systems by Oppeheim.
- Signals and Systems- An Introduction by Leslie Balme.

Subject Number: CREQ 245
Subject : Programming II
L T P C
1 0 2 4

Objectives of Course:
To introduce students different workshops types, tools used in each workshop, and manufacturing techniques of different workshops.

Week	Contents
1	**Introduction to programming using (Matlab)** - Introduction to (Matlab) - Menu bar , tool bar, and program windows
2-5	**Format, Numbers & Variables** Real, Integer , Inf ,NaN, Complex numbers - Variable Names - Examples on variable names - Show the results - Examples on (+ , - , * , /) - Outputs - Intermediate results during calculations.
6-8	**Built-in-functions** - Trigonometric Functions (sin , cos , tan , sec) - Elementary Functions (abs, log10 , log, exp, sqrt) **Functions** - polyarea (X,Y) - polygon - Standard Deviation - abs function - (max) - (min) - (mean)
9	**Logical commands** - Logical Operations - > greater than - >= greater than or equal - < less than - <= less than or equal - = = **equal** - = ~ not equal - Logical commands OR (|), AND (&).
10-12	**Strings manipulation** - Creating Strings - save **Conditional commands** - if end - If elseif else function - Examples - Problems
13-14	**loops** - for - while - Program control - Example - Problems.
15	**Matrices** - Matrices manipulation
16	**Matrices Operations** - Matlab as a calculator - Basic mathematical operations - + , - , * , / , ^
17-21	**Matrix construction** - Extracting Bits of a matrix - Dot product of matrices - Tabulating Functions - Matrix-Vector product - Matrix-Matrix product - Logical commands - Comparison tests - Examples - Problems.
22-23	**Vectors** - Row Vectors, Colon Notation (:) - Extracting Bits of a vector - Column Vectors - Transposing - Examples and Problems.
24-26	**Transformation functions** - Rotation, Scaling, Shearing, Reflection, Translation. **Write formatted data to file** - fid=fopen(filename,'w') fprintf(fid,'format',list of variables) - Examples. **Read formatted data from file** - fid=fopen(filename,'r') fscanf(fid,'format',size) - Examples.
27-30	**Plotting by Matlab** - plotting a matrix (Plot) - subplot(m,n,p) - Two dimensional plot - Three dimensional plot - Examples and Problems.

Subject Number: MATH 252
Subject : Mathematic II
L T P C

3 0 0 6 Objectives of Course: To provide detailed knowledge of basic principles, methods, and clear percentage of ordinary differential equations and partial differential equations used in engineering fields especially in mechanics, dynamics, structure, communications and electronics.	
Week	**Contents**
1-5	**Ordinary Linear Differential Equations** - 1st order differential equations - Separable - Homogeneous - Exact - Linear - Bernoulli - 2nd Order Differential Equations - Reducible to 1st order - Homogeneous - Non Homogeneous - Higher Order Differential Equations - Homogeneous - Non Homogeneous - Applications
6-9	**Sequences and Series** - Sequence - Series - Geometric Series - Tests of Convergence - Definition - The General Term Test - The Integral Test - The Comparison Test - The Limit Comparison Test - The Ratio Test - The Root Test - Alternating Series - Power Series - Interval of Convergence - Taylor Series - Maclaurin Series - Applications
10	**Fourier Series** - Periodic Function - Even and Odd Functions - Half Range Expansion Function
11-14	**Partial Differentiation** - Definition - Mechanism of Differentiation - Functions of Two Variables - Functions of Higher Variables - Transformation - Chain Rule - Total Differential -Gradient, Divergence, and Curl of Vector - Equation of Normal Line and Tangent Plane - Directional Derivative - Maxima, Minima and Saddle Points - Lagrange Theorem
15	**General Applications**
16-19	**Vector** - Vector in Space - Parallel Vectors - Triple Product - Volume of Box - Projection of Two Vectors - Applications - Equation of Line in Space - Equation of Plane in space - Applications - Vector Valued Functions - Curvature - Motion of Particle.
20-22	**Applications of Double and Triple Integrals** - Sketching of Geometric Shapes - Double Integrals - Triple Integrals - Applications - Jacobian Transformation - Area in Polar Curve - Surface Area
23	**Special Functions** - Gama Function - Beta Function
24-29	**Polar Coordinates** - Polar Curve Representation - Sketching of Polar Curve - General Curve Special Curve (Line, Circle, Conic Section) - Rotation of Axis - The Arc Length of Polar Curve - Surface Area of Rotation - The Angle Between The Tangent Line and Radius Vector For a Polar Curve - Slope of Tangent - Asymptotes - Plane Area.
30	**General Applications**

Recommended Books:

Text Books:

- Advanced Engineering Mathematics by Kreyszig.

Reference:

- Advanced Engineering Mathematics by Zill & Cullen.
- Introduction to Ordinary Differential equations by Ross.
- Introduction to Partial Differential equations by Sankara Rao.

Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	6AVTE 31	Core	Microprocessors & Microcontroller	2	3	5	6
2	AVTE 317	Core	Airplane aerodynamics-Stability & Control., Avionics Navigation System.	2	2	4	6
3	AVTE 323	Core	Antenna & Transmission Lines	2	0	2	4
4	AVTE 324	Core	Analogy & Digital Communications.	2	3	5	6
5	CREQ 347	Core	Training	-	-	-	-
6	AVTE 325	Secondary	Digital Signal Processing	2	3	5	6
7	CREQ 346	Secondary	Engineering and Numerical Analysis.	3	0	3	6
8	AVTE 318	Secondary	Analog and Digital Control	2	3	5	6
9	UREQ 364	General	Technical Writing and Presentation Skills, International Relations.	1	0	1	2
Total				16	14	30	42

%54The perce. of core hours =	%53The perce. of theoretical hours =
%43The perce. of secondary hours =	%47The perce. of practical hours =
The perce. of general hours = 3%	

Subject Number: AVTE316
Subject : Microprocessors & Microcontroller
L T P C
2 0 3 6

Objectives of The Course:
To develop understanding of principles, structure, programming and applications of microprocessors and microcontroller.

Theoretical syllabus

Weeks	Contents
1-2	**Memory** types of memory - semiconductor memories - ROM - RAM - Memory expansion - word length expansion - word capacity expansion - Types of buses.
3	**Introduction** Introduction to Intel family microprocessor - Architecture of 8085 microprocessor - Block diagram - Registers - ALU - Control unit.
4-5	**Instruction set architecture(ISA)** Instruction classification - Instruction set of 8085 - Assembly language programming - Opcode instruction format.
6-7	**Pin out of 8085 microprocessor, Buses system, and Control signals.**
8-9	**Stack and Subroutine**
10-11	**Looping - Counting - Time delay - Counters - Code conversion.**
12-13	**Timing diagram** Definition - Machine cycle - Instruction cycle - Clock signal representation - Types of machine cycle.
14-15	**Interrupts** Introduction - Types of interrupt (maskable and non maskable, vectored and non vectored, single-level and multi-level) - Overall 8085 interrupt structures - Interrupt instructions. Addressing modes
16-17	**Memory and I/O devices interfacing**
18	**A microcontroller Survey** 4-bit MC - 8-bit MC - 16-bit MC - 32-bitMC
19-20	**The 8051 MC** Introduction - Features - Hardware - Pin-out of 8051 - Interrupt structure -
21-23	**Instruction set and programming of 8051 MC**
24-25	8051 MC programming in C
26-27	Introduction of PIC 18F series
28-30	Arduino

Practical syllabus

1	Understanding of the 8085 kit program
2	Data transfer operations
3	Arithmetic operation (8-bit summation)
4	Logic operation (multiply by 2 using rotate instruction)
5	Clear of memory locations
6	Summation of odd order numbers
7	1s and 2s complement for 8-bit number
8	16 bit operations (summation and complement)
9	8-bit subtraction
10	8-bit multiplication
11	Find larger number
12	BCD to binary
13	Binary to BCD

14	Hexadecimal to ASCII code
15	ASCII TO binary
16	I/O ports
17	Time delay
18	Maximum repetition for block of data
19	8-bit division
20	Microcontroller Kit
21	Arithmetic operation
22	Logic operation
23	Interfacing
24	Control operation
25	Flowcode definition
26	Arduino
27	Arduino applications

Recommended Books:

Text Books:

- Digital Computer Electronics by Malvino Brown.
- Microcomputer systems 8086/8088 family, Architecture, Programming and Design, by Yu-Cheng Liu & Glenn A Gibson, 2nd Edition- July 2003, Prentice Hall of India.

Reference Books:

- Microprocessor and Interfacing, Programming & Hardware, by Douglas V Hall, 2nd Edition, Tata McGraw Hill .
- Microprocessor Architecture, Programming and Applications with the 8085, by Ramesh S Gaonkar, 4th Edition, Penram International.
- The 8051 Micro Controller by Scott Mackenzie

Subject Number: AVTE 318
Subject : Airplane aerodynamics - Stability & Control, Avionics Navigation System.
L T P C
2 0 2 6

Objectives of Course:
To build on the knowledge of basic aerodynamics and extends it to airplane aerodynamics. In additive, providing an introduction to the fundamentals of missile guidance systems, the science of aerial navigation and its related technology.

Theoretical syllabus

Week	Contents
1-3	**Concepts** Related to flow over airfoils - Compressibility effects on lift - Drag generation.
4-6	Differences between infinite and finite wings
7-10	Simplified analysis of aircraft performance
11-15	Various key concepts related to static stability of aircraft.
16-20	**Guidance** Introduction to missile guidance - Navigation systems - Kalman filtering and flight controls - principles proportional guidance and various factors affecting acceleration requirements and miss distance.
21-25	**Navigation** Major thrust on GPS - INS & their integration via the Kalman Filter
26-30	**Controls** Introduction to the 6-DOF Flight Dynamics model and methods of stability augmentation via linear feedback.

Practical syllabus

1	Simulation of nonlinear homing guidance
2	Comparison of linear and nonlinear solutions
3	Miss distance computation using method of AD joints
4	Noise propagation in command guidance
5	Simulation of beam rider guidance
6	Introduction to mapping toolbox
7	Simulation of Kalman filter
8	GPS, Aircraft dynamic,
9	Phugoid and short period modes
10	Effect of flight control transfer on aircraft stability
11	Demonstration of flight control on twin rotor MIMO System

Recommended Books:

Text Books:

- Introduction to Flight by J. D. Anderson, Jr. (2^{nd}/3^{rd}) Edition.
- Tactical and Strategic missile Guidance, 3^{rd} Edition by paul Zarchan.
- Avionics Navigation Systems 2^{nd} Edition by Nyron Kayton and Walter.
- Flight Dynamics Principles by M. V. Cook.

Reference Books:

- Gas Dynamics by E. A. John.
- Fundamentals of Aerodynamics by J. D. Anderson, Jr(2^{nd} Ed.).
- Aeroplane Aerodynamics by Domasch, Sherby and Conally.
- Aerospace Sensor Systems and Applications by Shmuel Merhav.

- Global Positioning System, Inertial Navigation and Integration by M. S. Grewal.

Subject Number: AVTE 323
Subject : Antenna and Transmission Lines
L T P C
2 0 0 4

Objective of course:
To provide an introduction to the fundamentals of electromagnetic wave propagation in both guided structures and open media. In additive, introducing a unified manner, the fundamentals of antenna theory, parameters, principles, arrays, and apply them to antenna analysis and measurement.

Theoretical syllabus

Week	Contents
1-3	Maxwell equations - Continue equation - Maxwell Equations for Time Varying Fields - Boundary Conditions - Time Varying Potentials - Heuristic Approach - Retarded Potentials - Maxwell Equation Approach - Helmholtz Theorem - Solution of The Wave Equation - Poynting Vector
4-6	Antenna Definition - Properties of Antenna - Types of Antenna - Block Diagram of Communication Systems - The Isotropic - The Ideal Dipole - Radiation Mechanism.
7-11	Antenna Parameters - Radiation Pattern - Field Regions - Radian And Steradian - Radiation Intensity - Directivity - Power Gain. Radiation Efficiency - Effective Length - Effective Area - Front To Back Ratio - Antenna Bandwidth - Antennas In Communication(Friis Formula) - Antennas in Radar System - Antenna Polarization - Polarization Mismatch - Reciprocity Theorem - Input Impedance of Antenna - Antenna Temperature.
12-15	Thin Linear Antenna - Short Dipole - Monopole - Dipole Antenna - Small Loop Antenna - Plot of Radiation Pattern - Image Theory.
16-19	Antenna Arrays - Linear Array - Pattern Multiplication - Two Element Array - Uniform Array - End Fire Array - Broad Side Array - Non Uniform Array - Binomial Array - Chebychev Array Synthesis - Planer Array
20-24	Special Antenna - Aperture Antenna - Folded Dipole Antenna - Yagi-Uda Antenna - Helical antenna - Biconical antenna - Spiral antenna - Microstrip patch antenna
25-27	Antenna Measurements - Antenna Measurement Range - Radiation Pattern Measurement - Gain and Directivity Measurement - Polarization Measurement - Input Impedance and Input Reflection Measurement.
28-30	Radio Wave Propagation - Ground Wave - Free Space Propagation - Ground Reflection - Surface Waves - Diffraction - Wave Propagation in Complex Environment - Troposphere Propagation - Troposphere Scatter - Ionosphere Propagation.

Recommended Books:

Text Books:

- Antenna Theory Analysis and Design by C.A> Balanis, John Wille Sons.
- Elements of Electromagnatics by Matthew N. O. Sadiku (2nd Edition)

Reference

- Antenna Theory and Design by Stutzman
- Field Wave Electromagnetic by Daived K. Cheng (2nd Edition).
- Engineering Electromagnetic by William H. Hayt (2nd Edition).

Subject Number: AVTE 324
Subject : Analogy & Digital Communications.
L T P C
2 0 3 6

Objectives of Course:
To introduce fundamentals of digital communications systems with emphasis on system architectures, signal-to-noise ratio, and bandwidth requirements. Also, introducing an introduction to the fundamentals of microwave devices with emphasis on distinctive features of their construction and understanding of the differences between electrical characteristics in lower frequency bands and RF/Microwave Frequencies.

Theoretical syllabus

Week	Contents
1-2	**Linear modulation** Double sideband modulation AM and DSB modulators and transmitters - SSB and VSB - Frequency conversion - Detection and receivers - Frequency division multiplexing.
3-4	**Amplitude modulation** The AM transmission - The AM spectrum - Power considerations - Phase representation - AM modulators - Other AM transmitter.
5	**Exponential modulation** Fundamental concepts - FM spectral analysis - FM bandwidth phase modulation (PM) - Transmitters and receivers
6	**Frequency modulation** The FM spectrum - Phasor representation - Narrowband FM - Broadband FM - FM generation - FM transmitter - Interference and noise - The PM spectrum PM/FM transmitter.
7-8	**Noise in CW modulation** System models and parameters - Interference noise in linear modulation - Noise in exponential modulation - Comparison of CW modulation system
9-10	**Sampling and pulse modulation** Sampling theory and practice - Analog pulse modulation - PAM, PDM and PPM - Pulse code modulation PCM, DM, and DPCM - Time-division multiplexing
11-12	**Transmission line theory** Transmission line equations - I/P impedance of lines with arbitrary loads - Distortion less lines - VSWR - Reflection coefficients - Matching of transmission lines
13-14	**Quantization process** - Pulse Code Modulation (PCM) - Representation of binary data - Noise consideration in PCM system - S/N performance of PCM - Limitations and modifications of PCM - Delta modulation - Delta-Sigma modulation - Adaptive delta modulation - Differential PCM (DPCM) - Inter-Symbol Interference (ISI) - pulse shaping to reduce ISI - Equalization - Equalizer types - Matching filter
14-16	**Digital Modulation** Amplitude Shift Keying (ASK) - Frequency Shift Keying (FSK) - Phase Shift Keying (PSK) - Coherent and non-coherent detection - Differential PSK (DPSK) - Error performance of binary systems - Quadrate Amplitude Modulation (QAM) - Quadrate Phase Shift Keying (QPSK) - Offset-QPSK (OQPSK) - Minimum Shift Keying (MSK) - Multilevel modulation techniques (MFSK, M-ray PSK& M-ray QAM) - Error performance of M-ray systems - Comparison between performance of digital modulation types - Band width efficiency - Power spectra of modulated signals - Carrier recovery & clock recovery.
17-20	**Channel coding** Error detecting codes - Error correcting codes - systematic and nonsystematic codes

	- hamming distance - hamming weight - linear block codes - Hamming Bound - Hamming code - Encoding of linear block codes - Decoding of linear block codes - cyclic codes - nonsystematic cyclic codes - systematic cyclic codes - Encoding with an (n-k) stage shift register - Encoding with a k-stage shift register - Syndrome calculation and Error detection - Convolution codes - Decoding of convolution codes (Viterbi algorithm)
21-23	**Spread Spectrum System** Types of spread spectrum systems - Frequency hopping - Time hopping - Chirp & hybrid - Linear code generation - Synchronization of spread spectrum systems - Acquisition SSS & tracking SSS - Application of SSS.
24-25	Overview of wireless communication system - Type of wireless systems - Generations of wireless communication system.
26-27	Introduction to cellular system - Frequency reuse - Channel assignment strategies - Handoff strategies - System capacity
28-29	Mobile communication system - GSM - CDMA 2000 - UMTS - WCDMA - Handoff management
30	Wireless network - Limitation of wireless network- GSM network hierarchy - Signaling and traffic
Practical syllabus	
1	Pulse generation circuit
2	Sampling circuit
3	ASK modulation
4	ASK demodulation
5	FSK modulation
6	FSK demodulation
7	PSK modulation
8	PSK demodulation
9	PFM modulation
10	PFM demodulation
11	PWM modulation
12	PWM demodulation
13	Random coding circuit
14	Difference modulation
15	Difference Demodulation
16	Power characteristics of transmit diodes
17	Transmission of AC voltage
18	Transmission of 2 analog signals in frequency division multiplex
19	Transmission of frequency-modulated signals
20	Transmission of pulse-frequency modulated signals
21	Transmission of a PCM signal
22	Transmission of a PCM signal
23	Waveguide wavelength and VSWR for different loads
24	Properties of an isolator
25	E-plane & H-plane TEE junction
26	Magic Tees
27	Coupling and Directivity of a directional coupler
28	Measurement of normalized impedance of unknown load.

Recommended Books:

Text Books:

- Modern Digital and Analog Communication System by B. P. Lathi, 3rd Edition.
- Microwave Devices & Circuits by Samuel Y. Liao

- Passive and Active Microwave Circuit by J. Helszajn.

Reference

- Introduction to Communication System by Ferral G. Stremler.
- Principles of Communication System by Herbert Taub & Donald L. Schilling.
- Electronic Communication System by George Kenned.

Subject Number: AVTE 325
Subject : Digital Signal Processing (DSP)
L T P C
2 0 3 6

Objectives of Course:
Learning the student to understanding the mathematical analysis for signals and how can processing it.

Theoretical syllabus	
Week	**Contents**
1-3	**Continuous and discrete signals and systems**
4-5	**Linear time-invariant system** Introduction (Impulse response, unit step response) - Properties of DSP system (linearity, time-invariance, causality)
6-8	**Discrete convolution** Linear convolution - Properties of convolution - circular convolution.
9-11	**Discrete correlation** Cross-correlation and auto-correlation sequence - Properties of Cross-correlation and auto-correlation sequence.
12-16	**Z-Transform** Definition of the Z-transform (Region of Convergence(ROC)) - Properties of the Z-transform - Stability - Evaluation of the inverse Z-Transform - Long division method - partial fraction expansion.
17-18	**Solution of the linear difference equations.**
19-20	**Frequency analysis of signals and systems**
21-24	**Discrete Fourier Transform (DFT) - Fast Fourier Transform (FFT)**
25	**Feedback system**
26-28	**Implementation of discrete time system** Structure of FIR system (direct form structure, cascade form structure) - Structure for IIR system (direct form structure, cascade form structure, parallel form structure)
29-30	**Introduction to programmable DSPs - Architecture of TMS 320C5X.**
Practical syllabus	
1-3	Study of DFT
4-8	IIR Filter Design
9-11	FIR Filter Design
12-14	FIR Kaiser and Equiripple Filter Design
15-17	Comparison of FIR and IIR Filter Design
18-20	Study of Simulink and Signal Processing Tool Box
21-24	Multi-rate Signal processing
25-27	DSP Processor, TMS 320C6713,DSK Experiments
28-30	TMS 320C6713-Real Time Processing

Recommended Books:

- Discrete Time Signal Processing, by Alan V Oppenheim, Ronald W Schafer, John R Back, PHI, 2nd Edition 2000.
- DSP Implementation using DSP microprocessor with Examples from TMS32C54XX, by Avtar singh, S. Srinivasan, Thamson / Brooks cole Publishers, 2003.
- Digital Signal Processing, by S. Salivahanan, A. Vallavaraj, Gnanapriya, McGraw-Hill / TMH, 2000.

Subject Number: CREQ 346
Subject : Engineering and Numerical Analysis.
L T P C
3 0 0 6

Objectives of Course:
To prepare students to solve complex problems of engineering using discrete mathematical concepts.

Week	Contents
1	**Laplace Transformations (L.T)** - Introduction - Definition of L.T
2	**Inverse Laplace Transformations (I.L.T.)** - Introduction - Definition of I.L.T
3	**Solution of differential equations using L.T** - Method of solution - Examples
4	**Applications** - Using L.T. for solving practical - Problems
5	**Solution of 2nd order D.E. using power series method** - Introduction - Solution near the ordinary point and singular point
6	**Bessel's equation + Legendre's equation** - Introduction - Application of solution
7	**Solution of partial D.E** - Definition - Methods of solution of P.D.E.
8	**Using of separation method** - Definition of separation method - Examples
9	**Applications of heat transfer** - Solution of unsteady one dimensional heat equation
10-12	**Matrices** - Introduction and definitions - Special matrices -Properties of matrices, Adj A, A^{-1} - Rank of a matrix - Vectors - Linear transformation - Orthogonal transformation - Eigen values - Eigen vectors
13	**Solution of non- linear equations** - Introduction - Application of non- linear equations
14	**Simple iteration method + Bisection method** - Introduction - Description of methods - Examples
15	**Newton –Raphson method** - Derivation - Applications - Square Roots - Roots of an arbitrary order - Reciprocal of any number.
16	**Solution of simultaneously linear equations** - Definition of equations - Methods of solution
17	**Direct methods** - Matrix inversion - Gauss- Elimination - Gauss -Jordan Elimination.
18	**Indirect methods** - Jacob's method - Gauss- Seidle method
19	**Applications** - Examples - problems
20	**Curve fitting** - linear Regression - Applications of linear regression - Transformation of nonlinear regression to linear regression
21	**Numerical interpolation** - Introduction - Linear interpolation - Quadratic interpolation
22	**Finite differences method + Forward and Backward and center expressions** - Introduction to finite differences method - Derivation of formulas with equal step

	size
23	**Newton and Lagrange forms** - Using this method for equal segment and unequal segments
24	**Numerical differentiation** - First derivative - Second derivative
25	**Numerical Integration** - trapezoidal rule - Simpson Rule (1/3) - Simpson Rule(3/8).
26	**Two dimensions integration** - Applications - Examples
27-28	**Solution of ordinary differential equations O.D.E.** - Taylor series method - Simple Euler method - Modified Euler method - Runge-kutta method.
29-30	**Finite differences method for solution of differential equations** - Ordinary differential equations - Partial differential equations Elliptic equation Parabolic equation Hyperbolic equation

Recommended Books:

Text Books:

- Fundamentals of numerical analysis by Stephen G. Kellison.

Reference Books:

- A First Course in Numerical Analysis by Anthony Ralston.
- Methods in Numerical Analysis by K. I. Nielsen.

Subject Number: AVTE319
Subject : Analog and Digital Control
L T P C
2 0 3 6

Specific Objectives of course:
To provide an introduction to the classical control systems for developing mathematical models to design electromechanical systems using transfer function, root locus and frequency response design techniques. In additive, analysis and implementation of digital control system.

Theoretical syllabus

Week	Contents
1	**Introduction** Introduction to control system - Definitions - Historical background - Mathematical background - General natural of engineering control problem - Basic elements of control system - Type of control system - Closed loop - Open loop - Time variant - Time invariant system - linear & non-linear system.
2-3	**Mathematical model of dynamic system** Mathematical model of writing differential equation - Electrical circuit components - Resistance - Capacitance - Inductance - Analogy of electrical system - Mathematical model of mechanical system - Translation system - Mass - Spring - Dashpot - Rotational system - Analogy of mechanical system- Transfer function - How to determine the transfer function - Advantage - Disadvantage - Properties of transfer function - Multivariable of transfer function.
4	**Block diagram** Definition of basic block elements - Procedure of drawing lock diagram - Block diagram reduction algebra - Mason's formula
4-5	**Time response analysis** Transient and steady-state region of response - Standard test signals - How to determine order of system from transfer - First order system - Second order system - Time response specification - Example of first order and second order - Higher order system response.
6	**Steady-state error response** Type of control system - How to determine order from transfer function - Position velocity and acceleration error constant - Method of dynamic error constant.
7	**System stability** Routh-Hurwitz criteria - Poles and zeros definition - Relation between system parameter and poles location.
8-9	**Root-locus analysis.**
10-13	**Frequency response analysis** Advantage and disadvantage of frequency analysis - Time concept of frequency response - Plotting of frequency response - Frequency response specification - Phase margin - Gain margin - Bode plot phase margin and gain margin of bode plot.
4-15	**Nyquist stability analysis**
16-17	**Design of control system** Design of control system from frequency response - Lead compensator - lag compensator - lead-lag compensator.
18	**Sample and hold systems**
19	**Jury stability criterion**
20	**Implementation of digital controllers**
21-23	**Tunable PID controllers**
24-25	**Linear versus nonlinear systems**

26	**Describing function analysis**
27	**Common nonlinearities**
28	**Analysis of non-linear systems using phase plane technique**
29	**Nonlinear control system design problem**
30	**Structure controller and sliding control**
Practical syllabus	
1	Open & Closed loop systems
2	Simulink Overview
3-4	Time response of First order system
5-6	Time response of First order system Using M-FILE
7-8	Residues value of First order system
9-10	Error steady state
11-12	Practical applications of 1'st order system
13-14	Time response of 2'nd order system
15-16	Characteristics of 2'nd order system
17	Time response Using M-FILE
18-19	Error steady state to 2nd order system
20-21	Pode plot of 2'nd order system
22	Analog communications system using Simulink
23	Digital communications system using Simulink
24-25	Nyquist theorem to 2'nd order system
26-27	Practical applications to 2'nd order system USING Simulink.
28-29	PID controllers
30	Sliding controllers

Recommended Books:

Text Books:

- Feedback Control Systems by philips and Harbor (3rd Edition).
- Digital Control and State variable methods: Conventional and Intelligent control systems, by M.Gopal, Tata McGraw Hill, 3rd Ed., 2009.

Reference Books:

- Modern Control System by Richard C. Dorf (5th Edition).
- Control Sytem Design using MATLAB by Bahram Shahian & Michael Hassul.
- User's Guide for The Student Edition of MATLAB by Duane Hanselman & Bruce Littlefield.
- H. K. Khalil, 'Nonlinear Systems', Prentice Hall, 3rd Ed., 2002.
- S.Sastry, 'Nonlinear Systems: Analysis, Stability and Control', Springer, 1999.

Subject Number: UREQ 364

Subject : Technical Writing and presentation Skills, International Relations.

L T P C
1 0 0 2

Specific Objectives of course:
To introduce the complex and ever-changing geo-political environment through a study and analysis of the behavior of nation states in the contemporary international states system.
Also enhancement of language skills and development critical thinking.

Theoretical syllabus

Week	Contents
1-3	**Presentation skills**
4-8	**Essay Writing:** Descriptive - Narrative - Discursive - Argumentative.
9-11	**Academic Writing:** How to write a proposal for research paper/ term paper - How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)
12-13	**Technical report Writing**
14-15	**Progress Report Writing**
16-20	**The new realities after the 9/11 emphasized new geo-political dimensions of the international relations.**
21-25	**The old concepts have been replaced by the new ones to cater for the complex and ever-changing global geo-political environment.**
26-30	**Apart from the basic concepts of the subject, some current issues such as new world order, terrorism, Iraq crisis, Afghanistan problem, ISIS grwoing and its effects on the people and indo-pak dialogue, have also been introduced in the syllabus which makes it more relevant and updated for the students.**

Reference Books:

- Writing. Advanced by Ron White. Oxford Supplementary Skills. Third mpression 1992. ISBN 0194354073 (particularly suitable for discursive, discursive, argumentative, and report writing).
- College Writing Skills by John Langan. McGraw-Hill higher eduction 2004.
- pattern of College Writing (4th edition) by laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.
- The Mercury Reader. A Custom Publication. Compiled by nother Llinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and maurice Scharton. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students.

Sl. No.	Code	Course Type	Course Title	L	P	T	C
1	AVTE 4110	Core	Avionics System Design & Instruments	2	2	4	6
2	AVTE 4111	Core	Analog& Digital Integrated Circuits FPGA-Based System Design	2	2	4	6
3	AVTE 4112	Core	Aircraft Radar and Microwave	2	2	4	6
4	AVTE 426	Core	Aircraft Data Networking	2	2	4	6
5	CREQ 448	Core	Final Project	0	6	6	6
6	AVTE 419	Core	Power Electronics	2	2	4	6
7	CREQ 449	Secondary	Industrial Engineering	2	0	2	4
8	UREQ 465	General	Professional & Social Ethics Leadership	2	0	2	4
Total				14	16	30	44

The perce. of core hours = 87% The perce. of secondary hours = 7% The perce. of general hours= 6%	The perce. of theoretical hours = 47% The perce. of practical hours = 53%

Subject Number: AVTE 4110
Subject : Avionics System Design & Instruments.
L T P C
2 0 2 6

Objective of the course:
To cover the essential ingredients of avionics system design including data buses, displays and power systems with emphasis on aircraft interfaces and avionics system architecture and fitting of avionics systems into aircraft as well as the integration of avionics system hardware and software.
To gain an insight into the concepts of measurements methods, direct or indirect and essential to appreciate the problems associated with instrumentations, learn basic characteristics, source of errors constructions, transduction principles of sensors & transducers employed in measurements of various non-electrical parameters commonly encountered in almost every branch of engineering

Theoretical syllabus	
Week	**Contents**
1	**Importance and role of avionics**
2-3	**Display and man-machine integration**
4-5	**Aerodynamics and aircraft control**
6	**Fly-by-wire flight control**
7	**Air data and air data systems**
8-9	**Autopilots and flight management systems**
10-11	**Avionics interfaces:** Data buses - Crew displays - Power - Maintenance - Physical interfaces.
12-13	**Avionics system integration** Data bus system - Integrated modular avionics - Commercial off-the-shelf (COTS).
14	**Unmanned air vehicles**
15	**Doppler and altimeter radars - Mapping and multimode radars**
16-17	**Units & dimensions, dimensional analysis.**
18-20	**DC bridge methods, AC bridge methods**
21-25	**Sensors & Transducers** Classifications - Resistance - Reactance change transducers - Potentiometric transducers - RTDs - Thermostats - Hot-wire anemometer - Strain-gauge - Inductive-type transducers - Thermoelectric transducers - Semiconductor sensors - Piezoelectric sensors - Ultrasonic sensors - Photo sensors.
26-30	**Instruments** Analog instruments - electrodynamometer type instruments - Induction type instruments Digital instruments - interfacing signals
Practical syllabus	
1-15	Determined by the department depending on assigned to the students and appropriate for laboratory facilities available.
16-30	Determined by the department depending on assigned to the students and appropriate for laboratory facilities available.

Recommended Books:

Text Books:

- Introduction to Avionics Systems by R. G. Collinson (2nd Edition).
- Avionics Navigation Systems by Myron Kayton and Walter R. Fried.
- Principles of Electronic Instrumentation & Measurements by Howard Berlin and Frank Gaetz.
- Modern Electronic Instrumentation & Measurements Techniques by William D. Cooper.

Reference Books:

- Aircraft Electricity & Electronics by K. Eismin. MC Graw Hill. 1994.

Subject Number: AVTE 4111
Subject : Analog& Digital Integrated Circuits, FPGA-Based System Design
L T P C
2 0 2 6

Objectives of Course:
To provide an insight into analysis and design of analog electronic circuits emphasizing amplifiers that find extensive application in computer, control systems, digital instrumentation, communications & radar, etc. In additive to, learning the design of digital electronic circuits with Field Programmable Gate Arrays.

Theoretical syllabus	
Week	**Contents**
1-2	**Differential amplifier in both its bipolar and FET forms.**
3	**Various output stages**
4-5	**Frequency response of amplifiers**
6-7	**Feedback analysis with focus on practical circuit applications of negative feedback**
8	**Stability problems in feedback amplifiers**
9	**Introduction to analog integrated circuits (bipolar and MOS) leading to analysis of a 741 operational amplifier**
10-11	**Design of filters**
12-13	**Tuned amplifiers**
14-15	**Oscillators**
16-17	**Introduction:** Digital design and FPGA - FPGA-based system design - Manufacturing process
18	**Transistor characteristics - CMOS logic gates - wires - Registers and RAM - Packages and pads**
19	**FPGA architectures - SRAM-based FPGAs**
20	**Permanently-programmed FPGAs**
21	**Circuit design of FPGA fabrics -Architecture of FPGA fabrics**
22	**Logic design process**
23	**Combinational network delay**
24	**Power and energy optimization**
25	**Arithmetic logic elements - Logic implementation using FPGAs**
26	**Physical design (PnR) for FPGAs**
27	**Synthesis process**
28-30	**Sequential design using FPGAs, sequential machine design process, sequential design style, FSM design, ASM design.**
Practical syllabus	
1	**Effects of emitter degeneration on gain and frequency response of a BJT differential amplifier**
2	**Lower/upper 3-dB frequencies**
3	**Mid-band gain**
4	**Bandwidth of a BJT amplifier with various feedback technologies**
5	**Performance analysis and optimization of a two stage amplifier with various feedback technologies**
6	**Class-A output stage design using emitter-follower configuration**
7	**Class-B and AB output stages using complementary pair of transistors**
8	**Gain and frequency response of 741 operational amplifier**

9	**Layout of 741 on ORCAD using discrete components**
10	**Component selection and simulation of 741 on Pspice**
11	**PCB manufacturing of 741 Operational Amplifier**
16	**Introduction to Verilog HDL**
17	**Gate-level modeling**
18	**Data flow modeling**
19	**Behavioral modeling, design, simulation.**
20	**Synthesis and fitting of combinational circuits**
21	**Design and implementation of an FSM and memory.**

Recommended Books:

- FPGA-Based System Design, by Wayne Wolf, 2004, Prentice Hall, ISBN: 0131424610.
- Verilog HDL, by Samir Palnitkar, Second Edition, 2003, Prentice Hall, ISBN: 0130449113.
- Advanced Digital Design with the Verilog HDL, by Michael D. Ciletti, First Edition, 2003, Prentice Hall, ISBN: 0130891614.
- Microelectronic Circuits By Adel S. Sedra & Kenneth C. Smith
- Analysis and design of Analog Integrated Circuits By Grey and Meyer.

Subject Number: AVTE 4112
Subject : Aircraft Radar and Microwave
L T P C
2 0 2 6
Objectives of Course:
To provide an introduction to the fundamentals of radar systems with emphasis on pulse radar, CW, FMCW, MTI, MTD, target tracking, radar performance in active environment, ESM, ECM, and ECCM at system level.

Theoretical syllabus

Week	Contents
1	**Introduction to Radar System:** Natural of radar and applications - What it can do?.
2	**Basic radar equation and important factors**
3	**Basic concepts of probabilistic detection used to analyze the performance of radar.**
4	**Principle and applications of CW and FMCW radar.**
5	**Basic concepts of analog/digital MTI.**
6-7	**Adaptive MTI and pulse Doppler radar.**
8-9	Airborne Radar - Space borne Radar - Synthesis aperture radar - SHAR and MST radar.
10-12	**Various tracking radar techniques** Object identification and tracking- Optical flow techniques - Hybrid technique
13-15	**Electronically steered phased array antenna and side lobe cancellation - Radar performance in wartime environment and electronic warfare - Basic principles of electronic support measures - Noise jamming - Frequency agility - Stealth technology and deceptive/expandable ECM**
16-19	**Introduction to microwave communication system, microwave spectrum, advantages and applications of microwave system.**
20-23	**Waveguide:** WG characteristics - Circular and rectangular WG, Passive and active microwave devices including solid state devices - Klystron - Magnetron - TWT and Twystrons as microwave oscillator and amplifier
24-28	**Microwave components and semiconductors - Microwave cavities - Directional coupler - Hybrid circuit - Circulators and isolator**
29-30	**Microwave telecommunication system architecture of the networks -Radar system.**

Practical syllabus

1-2	Basic Pulse Radar range and range resolution measurements
3	Radar cross section area of different types of target
4-5	CW and FMCW radar
6	Pulse Doppler radar with MTI and MTD
7-8	Sequential Lobing and mono-pulse target tracking radar
9	Electronically steered phased array antenna radar
10	Spot noise jamming and Burn-through range
11	Frequency agility and barrage noise jamming
12	Range gate pull off and angle detection jamming (Deceptive ECM)
13-15	Variable density Chaff cloud (Expendable ECM) against tracking radar.
16-17	Waveguide wavelength and VSWR for different loads
18-19	Properties of an isolator
20-21	E-plane & H-plane TEE junction
22-23	Magic Tees
24-25	Coupling and Directivity of a directional coupler

26-27	Measurement of normalized impedance of unknown load.

Recommended Books:

Text Books:

- Introduction to radar System, by M. Skolnik. 2nd Edition.
- Microwave Devices and Circuits By Samuel Y. Liao.
- Pasive and Active Microwave Circuits by J. Helszajn

Reference

- Understanding Radar Systems by Simon Kigsley and Shaun Que.
- Electronic Communication System by George Kenned.

Subject Number: AVTE 426
Subject : Aircraft Data Networking
L T P C
2 0 2 6

Objective of course:
Learn the student concepts of computer networks through its types, systems and protocols used.

Theoretical syllabus

Week	Contents
1	**Networks**: Overview and important concepts - Network categories (PAN, LAN, MAN,WAN, GAN) - Circuit switching vs. Packet switching - Baseband vs. Broadband transmission - Transmission modes (simplex, half duplex, full duplex) - Segments and backbones - Pear to Pear vs. Client/Server Networks - Protocols (elements, functions) - Transfer Rate (Digital BW, Throughput, Goodput).
2-3	**Networking Models:** OSI reference model (Layer1: Physical Layer, Layer2: Data-link Layer, Layer3: Network Layer, Layer4: Transport Layer, Layer5: Session Layer, Layer6: Presentation Layer, Layer7: Application Layer) - TCP/IP model (Network access layer ,Internet layer, Transport layer, Application layer).
4-5	**Physical Layer:** Mediums [Copper(Coaxial cable, Twisted Pair Cables),Fiber Optics (multimode, singlemode) - Wireless (RF, Microwaves, satellites, IR, FSO)] - Networking topologies (Bus, Ring, Dual Ring ,Star, Extended Star, Mesh, Wireless) - Physical vs. logical topologies. Noise (Cross talk, thermal, AC power noise, reference ground noise , EMI/RFI) - Losses (Copper medium losses, Fiber optics losses) -Timing issues (Dispersion, Jitter, Latency) - Coding [Liner coding (NRZL, NRZI, Manchester, Differential Manchester, MLT3) - Block coding (4B/5B, 8B,10B)] - Layer1 Devices (Repeaters, Hubs)
6-11	**Data-link layer protocols:** Ethernet (IEEE 802.3) [Regular Ethernet (mediums, topologies, encoding), Fast Ethernet (mediums, topologies, encoding), Gigabit Ethernet (mediums, topologies, encoding), 10Gigabit Ethernet (mediums, topologies, encoding), frame format ,Data-link Sublayers (MAC, LLC), CRC, MAC addresses (unicast, multicast, broadcast), MAC mechanism (CSMA/CD)]. Token Ring(IEEE 802.5) [Physical layer specifications (mediums, speeds, topologies, encoding), Frame types and Formats(Data Frame, Token Frame, Command Frame, Abort Delimiter Frame), Priority and reservation, MAC mechanism (Token passing)]. Fiber Distributed Data Interface FDDI [Physical layer specifications(mediums, speeds, topologies, encoding), Frame types and Formats(Data Frame, Token Frame, Station management Frame), MAC mechanism (Early Token Release)]. Data-link layer protocols (continued):WiFi (IEEE 802.11) [Physical layer specifications(topologies, FHSS, DSSS, OFDM, architecture, speeds), Versions (legacy, IEEE 802.11a, IEEE 802.11b, IEEE 802.11g, IEEE 802.11n), Frames Formats, MAC mechanism (CSMA/CA)], Bluetooth (IEEE 802.15) (architecture, format, layers)
12	**Layer2 Devices :** NIC - Ethernet Bridge (collision domains, broadcast domains, transparent bridging) - Ethernet Switches, Access point.
13-20	**Network Layer:** IPv4 [Datagram format, fragmentation, classfull addressing (subnetting, supernetting), classless addressing]. IPv6 (datagram format, addressing extension headers, tunneling). ICMP(messages, format, error reporting, queuing) - IGMP (group management,

	messages, format, error reporting) - ICMPv6(messages, format, error reporting). ARP - DNS (Name Space, Resolution, Messages) - NAT. Routing [routing tables, static routing, Dynamic routing, unicast routing, multicast routing, Protocols (RIP, OSPF, BGP)].
21-23	**Transport Layer:** UDP (format, port numbers, sockets) - TCP (format, port numbers, connection establishment and connection termination, flow control, error control, congestion control) - SCTP (format, flow control, error control, congestion control) - QoS (Flow characteristics, flow classes).
24-26	**TCP/IP application layer protocols:** e-mail (SMTP, POP3) - File transferring (FTP) - Web (HTTP, HTML, XML) - VoIP (RTCP, SIP, H323) - Management (SNPM).
27-28	**Security:** Encryption - Viruses - Hacking - Firewalls - VPNs - IPsec - SSL - WEP - WAP.
29-30	**WAN:** Protocols (PPP, PDN) - Systems (ATM, SONET , ISDN, DSL).
Practical syllabus	
1	NIC installation
2-3	Cat 5e cabling, cross and straight through
4	Pear to Pear 2- PC Network
5	LAN via Switches, Extended star LAN
6	Sharing (folders, drives)
7	Sharing Printers
8	Remote Desktop Connection
9-10	Privileges and Security in Win XP
11	Ad hoc WLAN
12	Infrastructure WLAN via AP
13-14	AP as (Client, PTP bridge, PTMP bridge)
15-16	WLAN security (MAC filtering, WEP, WAP)
17	Routers
18-19	Subnetting (Class A, Class B, Class C)
20-21	Utilities (ping, Ipconfig, telnet,traceout, nslookup)
22	Internet Connection Configuration and Sharing
23-26	Web Site Design (HTML, ASP)
27	Win Server 2003 Installation
28-30	Administration and configuration of Win Server 2003

Recommended Books:

Reference

- Data communications and Networking, 4th Edition, by Behronz A. Foruzan
- TCP/IP Protocol Suit 4th Edition, by Behronz A. Foruzan.

Subject Number: AVTE 419
Subject : Power Electronics
L T P C
2 0 2 6

Objective of the course:
It is aimed to design and analysis the electronic devices that used with power electrical.

Theoretical syllabus

Week	
1-4	**Power electronics systems** Introduction - History of power electronics - Power electronics semiconductor device - Power electronics converter - Advantage and disadvantage - Power electronics module - Computer simulation of power electronics circuit- Basic structure of power diode - IV characteristics of power diode - Reverse recovery - Power diode types (general purpose, fast switching and sckootky diodes) - Effect of forward and reverse recovery time of diode - Series and parallel connection of diodes - Diodes and rectifier circuit (half wave and full wave).
4-6	**Power transistor** Power MOSFET - PMOSFET characteristics - Application - Comparison MOSFET and BJT - Insulated Gate BJT - IGBJT structure - Equivalent circuit - Operation - Application.
7-12	**Thyristor principle and application** Basic structure of thyristor - IV characteristics - Two transistor model of thyristor - Turn ON and turn OFF characteristics - Thyristor gate characteristics - Thyristor protection circuit - di/dt protection circuit - dv/dt protection circuit - Snubber circuit design - Gate protection circuit - Heating - Cooling and mounting of thyristor - Gate triggering circuit - Pulse transformer - Photocoupler circuit - Thyristor commutation circuit - Natural commutation - Forced commutation - Load side - Resonant pulse - Complementary - Impulse - External pulse - Line side commutation circuit - Series and parallel connection of thyristor - Thyristor types - Phase controlled - Fast switching - Gate turnOFF- Bidirectional switch - Reverse conduction - Static induction - Light activated - FET-controlled - MOSFET controlled and other thyristor family - Programmable unijunction transistor (PUT) - Slicon unilateral switch (SUS) - Comparison between thyristor and transistor.
13-16	**Controlled rectifier:** Controlled technique, principle of phase controlled rectifier - Single phase half wave rectifier (resistive and resistive-inductive)load - Single phase half wave rectifier (resistive and resistive-inductive)load with freewheeling diode - Single phase full wave rectifier (resistive and resistive-inductive)load - Single phase full wave rectifier (resistive and resistive-inductive)load with freewheeling diode.
17-19	**Inverter** Introduction to inverter and application - Classification of inverters - Voltage source inverters - Current source inverters - Square wave inverters - Quasi square inverter - Pulse modulation inverters - Thyristor in inverters - Single phase half bridge inverters - (resistive and resistive-inductive load) - Single phase full bridge inverters (resistive, resistive-inductive) load - Performance parameter of inverters.
20-21	**Choppers** Introduction to chopper- Basic classification of chopper - Basic operation - Thyristor chopper circuit - Performance parameter.
22-24	**Voltage controller:** Introduction to voltage controller - Principle of ON-OFF control - Principle of phase control - Single phase bidirectional controller with resistive load - Single phase controller with resistive-Inductive load.

25-27	**Charge transport in semiconductor:** Drift current - Hall effect - Current density equation - Scattering mobility of carrier - Effect of electric field on mobility - Temperature effect on mobility - Effect of doping on mobility - Conductivity equations - Diffusion phenomena - Diffusion length - Diffusion in solids - Einstein's relation - Points defects.
28-30	pulse-width-modulated (PWM) inverters; UPS; types of converters; switched mode power supplies, AC and DC motor drives.
Practical syllabus	
1-2	**Characteristics of thyristor**
3-4	**Trigger thyristor by A.C current**
5-6	**Trigger thyristor by D.C current**
7-8	**Half- wave rectifier of (RL) without freewheeling diode**
9-10	**Half- wave rectifier of (RL) with freewheeling diode**
11-12	**Full- wave rectifier of thyristor**
13-14	**Trigger traic by A.C current**
15-16	**Trigger traic by D.C current**
17-18	**A stable Multivibrator (AMV)**
19-20	**Monostable Multivibrator (MMV)**
21-22	**The light newsmen by (555)**
23-24	**Square wave generator by (555)**
25-26	**A stable Multivibrator with large time**
27-28	**Circuit of logic test**
29-30	**Square wave generator by NAND gate**

Recommended Books:

- Cyril W. Lander, “Power Electronics,” Third Edition, 1993, McGraw-Hill UK, ISBN: 0077077148.
- Muhammad H. Rashid, “Power Electronics: Circuits, Devices and Applications,” Third Edition, 2004, Prentice Hall, ISBN:0131011405.
- Ned Mohan, William P. Robbins and Tore M. Undeland, “Power Electronics: Converters, Applications and Design,” Media Enhanced, Third Edition, 2003, John Wiley & Sons, ISBN:0471429082.

Subject Number: CREQ 347
Subject : Industrial Engineering
L T P C
2 0 0 4

Objectives of Course:
To learn the student about projects managements techniques through feasibility studying Efficiency considerations in the use of production requirements to solve the problem.

Week	Contents
1-2	**Preview** - Construction the frequency distribution - Representation the data in Histogram - Frequency polygon and ogive - Measures of location and measures of variation
3-6	**Tests of statistical hypotheses** - The nature of a statistical hypothesis - Two types of errors and tests about the mean of a normal distribution - Tests about the mean of a normal population when σ_2 unknown - Tests about the mean of abnormal population - Tests about the difference of two proportions - and tests about the difference of two means
7-10	**Analysis of variance (ANOVA)** - One- way analysis of variance with different sample sizes - Two- way analysis of variance
11-12	**Linear programming (L.P.)** - Definition of the L.P. - Forms of L.P. (general , canonical and standard) - Formulation of the mathematical model of the L.P. - Solving the mathematical model using a graphical and simplex methods - Solving the mathematical model using M-technique and two- phase method
13-15	**Transportation and Assignment models** - Finding the starting solution using northwest corner method - Least cost method - Vogell's approximation method (VAM) and Russel's approximation method (RAM) - Finding the optimal solution using stepping stone and multipliers methods - Solving the assignment models in maximized or minimized
16-17	**Network planning** Graph the network and find the critical path (CP) ; and the program evaluation and review technique (PERT) - Crashing the normal duration to execute the project with least costs
18-19	**Sequencing models** - Processing n jobs through one machine (shortest and largest processing time Spt and Lpt) - processing n jobs through two machines - Processing n jobs through m machines - processing n jobs through two machines with randomly technical routes
20-21	**Replacement and maintenance models** - Using the average total cost as a criterion to determine the period of replacement the machines - Cost of individual replacement for items of machines - Average cost group replacement per period as a criterion to determine the optimal replacement (individual or grouped) - Maintenance model
22-23	**Inventory models** - General inventory model - Static economic order quality (EOQ) models ; EOQ with price break ; and multi - item EOQ with storage limitation - Probabilistic EOQ model - Single - period models ; and multi period model
24	**ISO** - Total quality management (TQM) - ISO:9000
25-27	**Quality control** - Acceptance sampling - Calculation the OC-curve for single sampling schemes - rectifying schemes - double sampling schemes - and sequential sampling - Process control and control charts ($\bar{X}$ -chart , R-charts ,σ-charts and P-charts) - Quality level

	- Sampling plans (single , double and multiple)
28-30	**Reliability** - Reliability - Failure functions - Mean time to failure MTTF - Variance - Hazard rate function - Conditional reliability - Exponential and Weibull reliability functions - Reliability of system with serial and parallel configuration - Combined series – parallel system and high –level and low – level redundancy

Recommended Books:

- Industrial Engineering Mangement by A. Verma, Katson-India.

Subject Number: AVTE 4110
Subject : Professional & Social Ethics and Leadership
L T P C
2 0 0 4

Objectives of Course:
Teach the ethical issues of interest to the professional community to produce engineers who are not only good and responsible engineers, but also good and responsible citizens. In additive to, introducing the subject of leadership with emphasis on various theories, indicators, functions, responsibilities, qualities, and principles of effective leadership.

Week	Contents
1-15	This course introduces contemporary and controversial ethical issues facing the professional community. Topics include moral reasoning, moral dilemmas, law and morality, equity, justice and fairness, ethical standards, and moral development. Upon completion, students should be able to demonstrate an understanding of their moral responsibilities and obligations as members of the workforce and society.
15-30	Leadership being a task of great responsibility, demands courageous, selfless and devoted behavior. Definitions, theories, concepts, and indicators of effective leadership. Various individual - leader-task - team maintenance function. Traits - responsibilities - qualities - principles and approaches of leadership.

Recommended Books:

- TBusiness EthicsT: T Ethical Decision Making and CasesT, by C. Ferrell, John Fraedrich and Linda Ferrell, Sixth Edition, 2005, Houghton Mifflin Company, TISBN: 0618395733:
- Ethics in Engineering, by Mike W. Martin and Roland Schinzinger, Fourth Edition, 2005, McGraw-Hill, ISBN: 0072831154.