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વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી

યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

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-: કાર્યવાહી :-

એકેડેમિક કાઉન્સિલની સભા શુક્રવાર, તા.૨૧/૦૫/૨૦૨૧નાં રોજ બપોરે ૧૨:૩૦ કલાકે Social Distancing નું પાલન થાય તે રીતે ઓફલાઈન/ઓનલાઈન યુનિવર્સિટી કાર્યાલયના સેનેટ હોલમાં મળી હતી, જેમાં સભ્યોની હાજરી નીચે મુજબ હતી.

ક્રમ નં.	સભ્યશ્રીઓના નામ	હાજરી
(૧)	ડૉ. કિશોરકુમાર એન. ચાવડા (માનનીય કુલપતિશ્રી)	હાજર
(૨)	ડૉ. હેમાલીબેન એ. દેસાઈ	હાજર
(૩)	ડૉ. ભાવિનકુમાર રમણલાલ નાયક	હાજર
(૪)	ડૉ. જયેન્દ્રસિંહ પી. ગોહિલ	હાજર
(૫)	ડૉ. જયદીપ ચૌધરી	હાજર
(૬)	ડૉ. અજય નટવરલાલ પટેલ	હાજર
(૭)	ડૉ. વિજયકુમાર જોષી	હાજર
(૮)	ડૉ. વિપુલ આર. શાસ્ત્રી	હાજર
(૯)	ડૉ. સ્નેહલ કે. જોષી	હાજર
(૧૦)	ડૉ. દિલીપ એલ. વરસાણી	હાજર
(૧૧)	ડૉ. ટી. જી. ગોહિલ	હાજર
(૧૨)	ડૉ. કલ્પેશકુમાર કે. ટંડેલ	હાજર
(૧૩)	ડૉ. વિમલ એ. પંડ્યા	હાજર
(૧૪)	ડૉ. વિનોદરાય પટેલ	ગેરહાજર
(૧૫)	ડૉ. દિપકભાઈ ભોયે	ગેરહાજર
(૧૬)	ડૉ. અલ્પેશ એ. શાહ	હાજર

- (૧) એકેડેમિક કાઉન્સિલની તા.૧૨/૦૫/૨૦૨૧ની સભાની કાર્યવાહીની નોંધને બહાલી આપવા બાબત.
:: આથી ઠરાવવામાં આવે છે કે, એકેડેમિક કાઉન્સિલની તા.૧૨/૦૫/૨૦૨૧ની સભાની કાર્યવાહીની નોંધને બહાલી આપવામાં આવી હતી, ત્યારબાદ અધ્યક્ષશ્રીએ તેના પર સહી કરી હતી.

- (૨) B.C.A. (2nd Year), B.Sc.(Computer Science) દ્વિતીય વર્ષ , M.Sc.(CA) દ્વિતીય વર્ષ, M.C.A. દ્વિતીય વર્ષના અભ્યાસક્રમ અંગે તા.૭/૦૧/૨૧ ની સભામાં નીમેલ પેટાસમિતિએ તૈયાર કરેલ અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક:૨ અન્વયે નીચે મુજબના અભ્યાસક્રમ મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરેલ છે જે ભલામણ પર વિચારણા કરવા બાબત.

કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક: ૨

:: આથી ઠરાવવામાં આવે છે કે, કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિની તા.૭/૦૧/૨૧ની સભામાં નીમેલ પેટાસમિતિએ તૈયાર કરેલ નીચે મુજબ નાં નવા અભ્યાસક્રમ મંજૂર કરી તે મંજૂર કરવા એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

- (૧) B.C.A. (2nd Year) નો અભ્યાસક્રમ
- (૨) B.Sc. (Computer Science) દ્વિતીય વર્ષનો અભ્યાસક્રમ
- (૩) M.Sc. (CA) દ્વિતીય વર્ષનો અભ્યાસક્રમ
- (૪) M.C.A. દ્વિતીય વર્ષના અભ્યાસક્રમ

(એકેડેમિક વિભાગ)

:: આથી ઠરાવવામાં આવે છે કે, કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ વિદ્યાશાખાએ તેની તા. ૧૦/૦૫/૨૦૨૧ ની સભાના ઠરાવ ક્રમાંક : ૨ અન્વયે સ્વીકારેલ નીચે મુજબનાં અભ્યાસક્રમો મંજૂર કરવામાં આવે છે.

- (૧) B.C.A. (2nd Year) નો અભ્યાસક્રમ
- (૨) B.Sc. (Computer Science) દ્વિતીય વર્ષનો અભ્યાસક્રમ
- (૩) M.Sc. (CA) દ્વિતીય વર્ષનો અભ્યાસક્રમ
- (૪) M.C.A. દ્વિતીય વર્ષના અભ્યાસક્રમ

- (૩) એમ.એસ.સી.(આઈ.ટી./આઈ.સી.ટી.)ના એડહોક બોર્ડ દ્વારા મંજૂર થયેલા એમ.એસ.સી.(આઈ.ટી.) પ્રથમ વર્ષના અભ્યાસક્રમ અંગે ચર્ચા કરતા કોમ્પ્યુટર સાયન્સ અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક:૩ અન્વયે મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરેલ છે જે ભલામણ પર વિચારણા કરવા બાબત.

કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ વિદ્યાશાખાની તા.૧૦/૦૫/૨૦૨૧ની સભાનાં ઠરાવ ક્રમાંક: ૩

:: આથી ઠરાવવામાં આવે છે કે, એમ.એસ.સી.(આઈ.ટી./આઈ.સી.ટી.)ના એડહોક બોર્ડ દ્વારા મંજૂર થયેલા એમ.એસ.સી.(આઈ.ટી.) પ્રથમ વર્ષના અભ્યાસક્રમ મંજૂર કરી એકેડેમિક કાઉન્સિલને ભલામણ કરવામાં આવે છે.

(એકેડેમિક વિભાગ)

:: આથી ઠરાવવામાં આવે છે કે, કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિ તથા કોમ્પ્યુટર સાયન્સ વિદ્યાશાખાએ તેની તા. ૧૦/૦૫/૨૦૨૧ ની સભાના ઠરાવ ક્રમાંક :૩ અન્વયે સ્વીકારેલ એમ.એસ.સી. (આઈ.ટી.) પ્રથમ વર્ષનો અભ્યાસક્રમ મંજૂર કરવામાં આવે છે.

- (૪) સેનેટ સભ્યશ્રી કનુભાઈ ભરવાડ દ્વારા તેમના તા. ૧૫-૫-૨૦૨૧ના પત્રથી એમ. ફીલ. / પીએચ. ડી. સંશોધન અભ્યાસની થીસીસના મુલ્યાંકન અહેવાલ માટે ખૂબ સમય લાગતો હોય ડીજીટલ માધ્યમનો ઉપયોગ કરવા સાથે સમગ્ર બાહ્ય નિર્ણાયકની નિયુક્તિ, સમ્મતિપત્ર અને મુલ્યાંકન માટેની પ્રક્રિયા માટે સમય મર્યાદા નક્કી કરવા વિચારણા કરવા બાબત.

નોંધ :

- ૧: સંશોધનાર્થી દ્વારા સિનોપ્સીસ જમા કરાવ્યા બાદ બાહ્ય નિર્ણાયકની પેનલ રીસર્ચ એડવાઈઝરી સમિતિ પાસેથી મેળવી બાહ્ય નિર્ણાયકની નિયુક્તિ પીએચ. ડી. / એમ. ફીલ. ઓર્ડિનન્સ મુજબ કરવામાં આવે છે. નિયક્તિની જાણ કર્યા બાદ સમ્મતિ પત્ર માટે નિયમિત રીતે એક માસ થયેથી રીમાઈન્ડર કરવા સાથે જો બે થી ત્રણ રીમાઈન્ડર બાદ ટેલીફોનિક સંપર્ક કરી સમ્મતિ આપવાની જાણ સાથે ટેલીફોનિક સમ્મતિ મળ્યેથી થીસીસ મુલ્યાંકન માટે રેફરીને મોકલવામાં આવે છે અને જો ના સમ્મતિ હોય અથવા સંપર્ક થઈ શકતો ન હોય તો નવા બાહ્ય નિર્ણાયક નિયુક્ત કરવાની કાર્યવાહી કરવામાં આવે છે.
- ૨: સંશોધનાર્થી દ્વારા થીસીસ મુલ્યાંકન માટે જમા કરાવેથી ક્રમાંક (૧) મુજબ નિયુક્ત બાહ્ય નિર્ણાયકને થીસીસ મુલ્યાંકન માટે મોકલવામાં આવ્યા બાદ નિયમિત રીતે એક માસ થયેથી રીમાઈન્ડર કરવા સાથે જો બે થી ત્રણ રીમાઈન્ડર બાદ ટેલીફોનિક સંપર્ક કરી મુલ્યાંકન અહેવાલ જમા કરાવવાની જાણ કરવામાં આવે છે.

(અનુસ્નાતક વિભાગ)

- :: આથી ઠરાવવામાં આવે છે કે, ઓનલાઈન ડીજીટલ માધ્યમથી એમ.ફીલ, પીએચ.ડી. ના સંશોધન અભ્યાસની થીસીસના મુલ્યાંકન, અહેવાલ તેમજ પીએચ.ડી. ગાઈડશીપની અરજીઓ તેમજ તેના અહેવાલને લગતી કામગીરી પોર્ટલના માધ્યમથી કરવામાં આવે તેવી સિન્ડિકેટને ભલામણ કરવામાં આવે છે.

- (૫) ડૉ.સ્નેહલ જોષીનાં તા.૨૨/૧૦/૨૦૨૦ના રોજ મેલથી મળેલ પત્ર અંગે કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિએ તેની તા. ૦૭/૦૧/૨૦૨૧ ની સભાના ઠરાવ ક્રમાંક : ૭ અન્વયે કરેલ નીચેની ભલામણ કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી ફેકલ્ટીએ તેની તા. ૧૦/૦૫/૨૦૨૧ ની સભાના ઠરાવ ક્રમાંક : ૧ અન્વયે બહાલી આપેલ હોય તે અંગે વિચારણા કરવા બાબત.

કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસસમિતિની તા. ૦૭/૦૧/૨૦૨૧ ની સભાની ભલામણ ક્રમાંક : ૭

- :: આથી ઠરાવવામાં આવે છે કે, ડૉ.સ્નેહલ જોષીનાં તા.૨૨/૧૦/૨૦૨૦ના પત્ર ચર્ચામાં લેવામાં આવ્યો અને તે અંગે નીચે મુજબના નિર્ણયો લેવામાં આવ્યા.

૧. સેમે.-૬ માં આવેલ વિષય ૬૦૪ સેમિનાર પેપરનું નામ ડેઝર્ટેશન કરવામાં આવે જે બાબત Withdraw કરવામાં આવે છે.
૨. સેમે.-૬ માં યોજાતી સેમિનારની પરીક્ષાને સેમે.-૫ ની પ્રેક્ટીકલની પરીક્ષાને સમકક્ષ ગણવા બાબત.
- :: આથી ઠરાવવામાં આવે છે કે, સેમે.-૬માં યોજાતી બી.સી.એ.ની પેપર-૬૦૪ વિષય સેમિનાર પરીક્ષાને સેમે.-૫ માં યોજાતી પ્રેક્ટીકલ પરીક્ષા-૫૦૬ ના સમકક્ષ ગણવા માં આવે તે મુજબનો ઠરાવ અગાઉ બોર્ડ દ્વારા કરવામાં આવેલ હતો તથા આ બાબતેને આગળ ઉપરના તમામસત્તામંડળોમાં થી પારીત કરવામાં આવેલ હતો. આ બાબતને અનુલક્ષીને વધુમાં ઠરાવવામાં આવે છે કે, સેમિનાર-૬૦૪ ની યુનિવર્સિટી દ્વારા આયોજીત પરીક્ષાના પરીક્ષકોને સેમે.-૫ માં યોજાતી પ્રેક્ટીકલ પરીક્ષા-૫૦૬ ને સમકક્ષ મહેનતાણું આપવામાં આવે. વધુમાં ૬૦૪-પરીક્ષા પ્રોજેક્ટ પરીક્ષા થી અગલ યોજાતી હોવાથી તેમજ તેના પરીક્ષકો પણ અલગ નિમણૂક પામતા હોવાથી, પરીક્ષા કેન્દ્રો દ્વારા જરૂરી નિમણૂકો પ્રેક્ટીકલ પરીક્ષા સેમે.-૫૦૬ ને

- અનુરૂપ જ કરવામાં આવે તથા તે મુજબનું મહેનતાણું આપવામાં આવે એવી કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફો. ટેકનોલોજી ફેકલ્ટીને ભલામણ કરવામાં આવે છે.
૩. :: આથી ઠરાવવામાં આવે છે કે, બી.સી.એ. કોર્સમાં સેમે-૧ થી સેમે.-૫ દરમિયાન ૬ ક્રેડિટ ના પ્રેક્ટીકલ વિષય માટે બેચ દીઠ સાપ્તાહિક કુલ ૧૨ કલાકનું લેબવર્ક આપવા માં આવે છે જે પૈકીના ૬ કલાકના લેબવર્ક માટે લેબમાં આધ્યાપકની હાજરી અનિવાર્ય રહેશે તથા આ ૬ કલાક નો વર્કલોડ જ અધ્યાપકનાં કુલ વર્કલોડની ગણતરીમાં લેવામાં આવશે. આ ઉપરાંત વધારાના ૬ કલાકનું લેબવર્ક પણ ફરજીયાત પણે વિદ્યાર્થીએ કરવાનું રહેશે. જે દરમિયાન વિદ્યાર્થી લેબમાં સ્વ-અભ્યાસ તેમજ પ્રેક્ટીસ કરી શકશે. જેનો સમયગાળો આધ્યાપકના વર્કલોડમાં ગણવામાં આવશે નહીં. આ વધારાના ૬ કલાકના સમયગાળા દરમિયાન વિદ્યાર્થી દ્વારા આધ્યાપક પાસેથી માર્ગદર્શન મેળવી શકાશે તથા આ માર્ગદર્શનના સમયને કન્સલ્ટેશન સમય તરીકે જ ગણવામાં આવશે. વધુમાં ઠરાવવામાં આવે છે કે બેચ સાઈઝ અગાઉ નિર્ધારિત કર્યા મુજબની જ રાખવા ફેકલ્ટીને ભલામણ કરવામાં આવે છે.

કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાની તા. ૧૦/૦૫/૨૦૨૧ ની સભાની

ભલામણ ક્રમાંક : ૧

- :: તા. ૦૭/૦૧/૨૦૨૧ ની બોર્ડની સભામાં લેવાયેલા તમામ નિર્ણયોને બહાલી આપવાનો ઠરાવ કરવામાં આવે છે.

(એકેડેમિક વિભાગ)

- :: આથી ઠરાવવામાં આવે છે કે, પ્રસ્તુત બાબત સ્વીકારી તે અંગે સિન્ડિકેટને ભલામણ કરવામાં આવે છે.

- (૬) પરીક્ષા વિભાગનાં સાયન્સ ફેકલ્ટીમાં આગામી એફ.વાય.બી.એસસી સેમેસ્ટર : ૦૧ની એક્સ્ટર્નલ પ્રાયોગિક પરીક્ષા જે કોલેજમાં લેવાની બાકી રહેલ ગયેલ છે, તો આગામી લેવાનારી પરીક્ષાઓ કેવી રીતે લેવી તે બાબતે ડીનશ્રી ટેલીફોનિક જણાવેલ છે કે ONLINE લેવી હોય તો તે મુજબ યોગ્ય તે બાબતે વિચારણા કરવા બાબત...

(પરીક્ષા વિભાગ/સાયન્સ)

- :: આથી ઠરાવવામાં આવે છે કે, F.Y.B.Sc. Sem.-I to IV ની એક્સટર્નલ યુનિવર્સિટી પ્રાયોગિક પરીક્ષા કોલેજો દ્વારા લેવામાં આવે છે. જે કોલેજોની F.Y.B.Sc. Sem.-I ની એક્સટર્નલ યુનિવર્સિટી પ્રાયોગિક પરીક્ષા બાકી હોય તે કોલેજોએ હાલ ઓફલાઈન પ્રાયોગિક પરીક્ષા લેવી શક્ય ન હોય માટે F.Y.B.Sc. Sem.-I ની પ્રાયોગિક પરીક્ષામાં પૂછાતા પ્રયોગોમાંથી Viva-voice સ્વરૂપે ઓનલાઈન પ્રાયોગિક પરીક્ષા વેકેશન પૂર્ણ થયેથી લઈ લેવી અને તેના માર્ક્સ ઓનલાઈન યુનિવર્સિટીને જમા કરાવવાના રહેશે.

- (૭) 'જ્ઞાન સંગમ' અંતર્ગત વિનયન, વાણિજ્ય અને વિજ્ઞાનના પ્રથમ વર્ષ માટેના અભ્યાસક્રમો લાગુ કરવામાં આવેલ છે. ત્યાર બાદના ક્રમશઃ અભ્યાસક્રમોની રચના કરવા અંગે વિચારણા કરવા બાબત.

(એકેડેમિક વિભાગ)

- :: આથી ઠરાવવામાં આવે છે કે, 'જ્ઞાન સંગમ' અંતર્ગત વિનયન, વાણિજ્ય અને વિજ્ઞાન તથા કાનૂન વિદ્યાશાખામાં અભ્યાસક્રમો તૈયાર કરવા તેમજ પ્રવર્તમાન અભ્યાસક્રમોમાં સુધારા કરવા સંબંધીત બોર્ડ ઓફ સ્ટડીઝને રીફર કરીએ તથા જરૂર

જણાય તો સંબંધિત વિષયની બોર્ડ ઓફ સ્ટડીઝના સભ્યો સિવાયના અન્ય જે તે વિષયના તજજ્ઞોને ડીનશ્રીઓ તેમજ ચેરમેનશ્રીઓની સંમતિથી સામેલ કરી શકાશે.

(૮)(માનનીય કુલપતિશ્રીનાં પગલાંની નોંધ)

૧. યુનિવર્સિટી ધારાની કલમ ૪૭-એ અન્વયે આર્કિટેક્ચર વિદ્યાશાખા હેઠળની અભ્યાસસમિતિઓએ પ્રાશ્નિકો/પરીક્ષકોની નિમણૂક સમિતિઓએ માર્ચ-૨૦૨૧ માં લેવાયેલી બી.આર્કિટેક્ચર અને એમ.આર્કિટેક્ચરની પરીક્ષાઓ માટે પ્રાશ્નિકો/પરીક્ષકોની તૈયાર કરેલી ભલામણ યાદી
તથા
૨. મેડીકલ વિદ્યાશાખા હેઠળની બી.ઓપ્ટોમેટરી (૧ સેમેસ્ટર રેગ્યુલર, ૩ અને ૫ સેમેસ્ટર સપ્લીમેન્ટરી પરીક્ષા)ની પરીક્ષાઓ માટે પ્રાશ્નિકો/પરીક્ષકોની નિમણૂક સમિતિએ એપ્રિલ-૨૦૨૧માં લેવાનારી પરીક્ષાઓ માટે પ્રાશ્નિકો/પરીક્ષકોની તૈયાર કરેલ ભલામણ યાદી.
તથા
૩. આર્કિટેક્ચર વિદ્યાશાખા હેઠળની અભ્યાસસમિતિની પ્રાશ્નિકો/પરીક્ષકોની નિમણૂક સમિતિએ જુન/જુલાઈ-૨૦૨૧થી લેવામાં આવનાર બી. આર્કિટેક્ચર અને એમ. આર્કિટેક્ચરની પરીક્ષાઓ માટે પ્રાશ્નિકો/પરીક્ષકોની તૈયાર કરેલ ભલામણ યાદી

:: આથી ઠરાવવામાં આવે છે કે, માનનીય કુલપતિશ્રીએ લીધેલ ઉપરોક્ત પગલાંની નોંધ લેવામાં આવે છે.

- (૯) એકેડેમિક કાઉન્સિલ તા. ૧૨/૦૫/૨૦૨૧ ના ઠરાવ ક્રમાંક : ૧૫ ના મુદ્દા ક્રમાંક : ૮ અન્વયે પરીક્ષા વિભાગ દ્વારા ડીનશ્રીઓ પાસેથી MCQ મુજબનાં પ્રશ્નપત્રો તૈયાર કરવાની માર્ગદર્શિકા મંગાવવામાં આવી હતી, જે અન્વયે ડીનશ્રીઓ તરફથી મળેલ માર્ગદર્શિકા અંગે વિચારણા કરવા બાબત.**

એકેડેમિક કાઉન્સિલની તા. ૧૨/૦૫/૨૦૨૧ ની સભાનો ઠરાવ ક્રમાંક : ૧૫

- :: આથી ઠરાવવામાં આવે છે કે, હાલમાં લેવાની બાકી રહી ગયેલ તથા આવનાર એક્સટર્નલ સહિતની પરીક્ષાઓ સરકારશ્રીની ગાઈડલાઈન મળ્યેથી નીચે મુજબ લેવાનું રાખવું તેમજ મેડીકલમાં ઓપ્ટોમેટ્રી સિવાયની તમામ પરીક્ષાઓ જે તે લાગુ પડતી પ્રોફેશનલ કાઉન્સિલની ગાઈડલાઈન મુજબ લેવી.**
- (૧) યુનિવર્સિટીની તમામ પરીક્ષાઓ ઓનલાઈન મોડથી MCQ પદ્ધતિથી લેવી.
 - (૨) યુ.જી. અને પી.જી. ના તમામ અભ્યાસક્રમો માં Online MCQ પદ્ધતિથી પરીક્ષા લેવી.
 - (૩) જે વિદ્યાશાખામાં પ્રાયોગિક પરીક્ષાઓ લેવાની થાય છે, તે વિદ્યાશાખાના તમામ અભ્યાસક્રમોની પ્રાયોગિક પરીક્ષાઓ સરકારશ્રીના માર્ગદર્શન મુજબ લેવાની રાખવી.
 - (૪) MCQ પરીક્ષાઓ ૫૦ માર્ક્સની રાખવી તથા જે તે વિષયોના હેડ મુજબના માર્ક્સ ગણવા માટે પ્રોરેટા પદ્ધતિથી માર્ક્સને તબદીલ કરવા. પરીક્ષાનો સમય ૧:૦૦ કલાકનો રાખવો.
 - (૫) જે અભ્યાસક્રમોમાં પરીક્ષાનું પ્રશ્નપત્ર તૈયાર કરવા માટે યુનિટદીઠ માર્ક્સનું ભારાંક નક્કી કરવામાં આવેલ છે, તે તમામ અભ્યાસક્રમોમાં યુનિટના ભારાંક ૧.૫ ઘણા વધારે પ્રશ્નો કાઢવાના રાખવા તથા આ તમામ પ્રશ્નોના યુનિટ મુજબ રેન્ડમ ઓર્ડરમાં પ્રશ્નો પુછવાના રાખવા.
 - (૬) જે અભ્યાસક્રમમાં યુનિટ દીઠ ભારાંક નથી ત્યાં તમામ યુનિટોને સરખા ભારાંક ગણી, ભારાંકના ૧.૫ ઘણા પ્રશ્નોનું પ્રશ્નપત્ર તૈયાર કરવું. યુનિટ દીઠ રેન્ડમ પ્રશ્નો પુછવાના રાખવા.
 - (૭) પ્રશ્નપત્રોના બે સેટ મંગાવવાનું રાખવું.

- (૮) જે તે વિદ્યાશાખાના ડીનશ્રી પાસે MCQ મુજબનાં પ્રશ્નપત્રો સેટ કરવાની માર્ગદર્શિકા તૈયાર કરાવી તે મુજબ પ્રશ્નપત્રો સેટ કરાવવાં.
- (૯) MCQ મુજબનાં પ્રશ્નપત્રો સ્વહસ્તાક્ષરમાં પણ સ્વીકારવાનાં રાખવા.
આ મુજબનું પરીક્ષાનું માળખું ગોઠવવા જરૂરી વ્યવસ્થા ઉભી કરવા તથા ઉપરોક્ત માળખું મંજૂર કરવા સિન્ડિકેટને ભલામણ કરવામાં આવે છે.
વધુમાં ઠરાવવામાં આવે છે કે, હાલમાં જમા થયેલ પ્રશ્નપત્રોના સેટ પ્રિન્ટીંગ માટે ન મોકલવા અને તે જ પ્રાશ્નિકો પાસેથી પ્રશ્નપત્રો કઢાવવા.

(પરીક્ષા વિભાગ)

:: આથી ઠરાવવામાં આવે છે કે,

- (૧) જે અભ્યાસક્રમોમાં પરીક્ષાનું પ્રશ્નપત્ર તૈયાર કરવા માટે યુનિટ દીઠ માર્ક્સનું ભારાંક નક્કી કરવામાં આવેલ છે, તે તમામ અભ્યાસક્રમોમાં યુનિટનું ભારાંક જળવાઈ રહે તે રીતે પ્રશ્નો (MCQ) કાઢવાના રાખવા.
- (૨) જે અભ્યાસક્રમમાં યુનિટદીઠ ભારાંક નથી ત્યાં તમામ યુનિટોને સરખાં ભારાંક ગણી પ્રશ્નો પૂછવાં.
- (૩) પેપરસેટર પાસે ૫૦ – ૫૦ માર્ક્સ બે પ્રશ્નપત્રોના બે સેટ મંગાવવા. જ્યાં જરૂરી હોય ત્યાં પ્રશ્નપત્રો અંગ્રેજી અને ગુજરાતી માધ્યમમાં આપવાના રહેશે.
ગ્રામઅભ્યાસ વિદ્યાશાખાના પ્રશ્નપત્રો ફક્ત ગુજરાતી માધ્યમમાં જ આપવાના રહેશે.
- (૪) ઓનલાઈન પરીક્ષા દરમ્યાન વિદ્યાર્થી કોઈ પણ કારણોસર DISCONNECT થાય તો ઓટો ગ્રેસ ટાઈમ વધુમાં વધુ ૧૫ મીનીટનો આપવો.
- (૫) આર્કિટેક્ચર વિદ્યાશાખામાં ઓનલાઈન જયુરી/ વાયવાથી પરીક્ષા લેવાની રહેશે.
- (૬) આર્ટ્સ, કોમર્સ, સાયન્સ, કોમ્પ્યુટર સાયન્સ, મેનેજમેન્ટ, કાનૂન અને ગ્રામઅભ્યાસ વિદ્યાશાખા હેઠળ ચાલતા તમામ યુ.જી. અને પી.જી. રેગ્યુલર અભ્યાસક્રમો માટે પ્રશ્નપત્રના કુલ ગુણ ૫૦ રહેશે તથા સમય ૧ કલાકનો રહેશે. જ્યાં ૭૦ ગુણનું પ્રશ્નપત્ર હોય ત્યાં પણ ૫૦ ગુણના પ્રોરેટાના ધોરણે ૭૦ ગુણમાં રૂપાંતર કરવાનું રહેશે. તે જ રીતે ૧૦૦ માર્ક્સનું પ્રશ્નપત્ર હશે ત્યાં ૫૦ માંથી ૧૦૦ માર્ક્સ કન્વર્ટ કરી ગણવાના રહેશે.
- (૭) ગણતરીવાળા વિષયનું પ્રશ્નપત્રનું માળખું સેક્શન – ૧ માં ૧ માર્ક્સના કુલ ૩૦ પ્રશ્નો અને સેક્શન – ૨ માં કુલ ૨ માર્ક્સના કુલ ૧૦ પ્રશ્નો એમ મળીને કુલ ૪૦ પ્રશ્નોનું રહેશે અને આવા બે પ્રશ્નપત્રોના સેટ જમા કરાવવાના રહેશે.
- (૮) FACT ના ઓનલાઈન પરીક્ષા સંબંધિત અગાઉનો પરિપત્ર તા. ૨૧/૧૦/૨૦૨૦ ના પરિપત્ર ક્રમાંક :પરીક્ષા/હોમિયોપેથી/૧૨૮૭૧/૨૦૨૦ નો યથાવત્ સ્વીકાર કરવો.
વધુમાં સદર નિયમો પરીક્ષા અંગેના વિસ્તૃત રીપોર્ટ આવ્યા પછી રીપોર્ટના વિશ્લેષણ કરવાથી જે વિદ્યાર્થીઓ ઉપરોક્ત પરીપત્રમાં દર્શાવેલ ગેરરીતિ આચરતા માલૂમ પડશે તો પણ લાગુ પડશે.
- (૯) જ્યાં જરૂરી હોય ત્યાં જુના અને નવા અભ્યાસક્રમો અન્વયે અલગ પ્રશ્નપત્રો તૈયાર કરવાના રહેશે.

- (૧૦) કોમ્પ્યુટર ફેકલ્ટીમાં યુ.જી. અને પી.જી. માં લેવાનારી ઓનલાઈન પ્રેક્ટીકલ / પ્રોજેક્ટ / સેમીનાર / વાયવા / ડેઝર્ટેશન / ટર્મ પેપરની પરીક્ષાઓ વર્ષ ૨૦૨૦ દરમિયાન લેવાયેલ પરીક્ષાઓ મુજબ અને તે માટેના પરિપત્ર અનુસાર લેવાની રહેશે. આ સિવાય અન્ય કોઈ પણ ફેકલ્ટીમાં પ્રોજેક્ટ / સેમીનાર / વાયવા / ડેઝર્ટેશન / ટર્મ પેપર હોય ઉપરોક્ત પરિપત્ર લાગુ પડશે.
- (૧૧) પ્રત્યેક પ્રશ્ન ટાઈમબાઉન્ડ રહેશે તથા ટાઈમમાં પૂર્ણ થયા બાદ વિદ્યાર્થી આવો પ્રશ્ન રી-વીઝીટ કરી શકશે નહીં.
- (૧૨) અધ્યાપકો દ્વારા ઓનલાઈન પરીક્ષાની પ્રોક્ટરશીપ કરાવવાની રહેશે.
- (૧૩) બી.એડ./એમ.એડ્. માટે નીચે મુજબ રહેશે.
- ૩૫ ગુણ માટે
૧. ૩૫ ગુણ માટે (બે એકમ હોય) તેમાં ૧ એકમમાંથી ૧૮ પ્રશ્નો ૧ માર્ક્સના અને ૨ એકમમાંથી ૧૭ પ્રશ્નો ૧ માર્ક્સના પૂછવાના રહેશે. આમ કુલ ૩૫ પ્રશ્નો ૩૫ માર્ક્સના રહેશે.
 ૨. પરીક્ષાનો સમય ૪૫ મિનિટનો રહેશે.
 ૩. કુલ ૩૫ MCQ પ્રકરણના પ્રશ્નો રહેશે. જેમાં ચાર વિકલ્પો આપવાના રહેશે. જે A, B, C, D માં હશે.
 ૪. દરેક પેપર સેટરે ૨ સેટ આપવાના રહેશે.
 ૫. આન્સર કી પ્રશ્નપત્રદીઠ અલગ આપવાની રહેશે.
- ૭૦ ગુણ માટે – ૫૦ માર્ક્સની પરીક્ષા
૧. ૩૫ ગુણ માટે (ચાર એકમ હોય) તેમાં ૧ અને ૪ એકમમાંથી ૧૩ પ્રશ્નો ૧ માર્ક્સના એટલે કે, ૨૬ માર્ક્સ અને ૨ અને ૩ એકમમાંથી ૧૨ પ્રશ્નો ૧ માર્ક્સના એટલે કે, ૨૪ માર્ક્સ પૂછવાના રહેશે. આમ કુલ (૨૬ + ૨૪) ૫૦ પ્રશ્નો ૫૦ માર્ક્સના રહેશે.
 ૨. પરીક્ષાનો સમય ૬૦ મિનિટનો રહેશે.
 ૩. કુલ ૫૦ MCQ પ્રકરણના પ્રશ્નો રહેશે. જેમાં ચાર વિકલ્પો આપવાના રહેશે. જે A, B, C, D માં હશે.
 ૪. દરેક પેપર સેટરે ૨ સેટ આપવાના રહેશે.
 ૫. આન્સર કી પ્રશ્નપત્રદીઠ અલગ આપવાની રહેશે.
- (૧૪) એક્સટર્નલ અભ્યાસક્રમની પરીક્ષા પદ્ધતિ અંગે હવે પછી જાહેરાત કરવામાં આવશે.
- (૧૫) હોમિયોપેથીક વિદ્યાશાખાની પરીક્ષા પદ્ધતિ તેમની એપેક્ષ બોડીના નિયમો અનુસાર કરવાની રહેશે.

અધ્યક્ષસ્થાનેથી રજૂ થયેલ બાબત

- (૧૦) વિવિધ પરીક્ષાઓમાં વિદ્યાર્થીઓના સેમેસ્ટર – ૧ અને ૩ ના પરીણામમાં નાપાસ થવાને કારણે વિદ્યાર્થી પાછળ થી પરીક્ષા પાસ કરે છે. જેના કારણે વિદ્યાર્થીઓની બીજા તેમજ ચોથા સેમેસ્ટરમાં અગાઉના સેમેસ્ટરની રીમાર્ક્સ ન આવવાને કારણે પરીણામ એ.ટી.કે.ટી. અથવા નાપાસમાં જાહેર કરવામાં આવે છે. તેમજ વિદ્યાર્થીઓની માર્ક્સશીટમાં અગાઉના

સેમેસ્ટરની રીમાર્ક્સ ન આવવાને કારણે શીષ્યવૃત્તિના આવેદનપત્ર ભરી શકાતા નથી જેને કારણે વિદ્યાર્થીઓ માર્ક્સીટમાં અગાઉના સેમેસ્ટરની રીમાર્ક્સ લઈ પરીણામમાં સુધારો કરવાનું જણાવે છે. (અરજીઓ સામેલ છે.) યુનિવર્સિટી તરફથી કોલેજોને જાણ કરવામાં આવેલ હતી કે પરીપત્ર ક્રમાંક Exam/A/7917/2014 Date: 4/8/2014 મુજબ પરીણામમાં કોઈ ભુલ નથી. છતાં પણ કોલેજ તેમજ વિદ્યાર્થીઓ તરફથી અરજી મળે છે. આ બાબત અંગે નીચે મુજબના મુદ્દા વિચારણા કરવાના થાય છે.

- હાલ સેકન્ડ તથા ફોર્થ સેમેસ્ટરની માર્ક્સીટમાં Pass/Fail/First/First Dist./Second class YGPA અનુસાર આપવામાં આવે છે તથા અગાઉના સેમેસ્ટર અનુસાર ATKT આપવામાં આવે છે.
- એકેડેમીકવિભાગના ઠરાવ મુજબ CGPA ની ગણતરી બધા સેમેસ્ટર પર કરવાની હોય પ્રથમ તથા દ્વિતીય વર્ષમાં YGPA/CLASS ની જગ્યાએ જો સેકન્ડ તથા ફોર્થ સેમેસ્ટરમાં ફક્ત Pass/Fail રીઝલ્ટ આપવામાં આવે તો ઉપરની સમસ્યાનો ઉકેલ આવી શકે તથા ફોર્મવીડો સિવાયના વિદ્યાર્થીને અગાઉના સેમેસ્ટરમાં પ્રવેશ મળી શકે.
- હાલની જેમ પાંચમા સેમેસ્ટરના પ્રવેશ માટે પ્રથમ વર્ષ પાસ ન હોય તો સેમેસ્ટર – ૪ માં W.O.165 માં રીઝલ્ટ રોકી શકાય. તથા છઠા સેમેસ્ટરમાં વિદ્યાર્થીને CGPA/CLASS આપવાનો થાય છે.
- સ્નાતક ની જેમ અનુસ્નાતક કક્ષાએ પણ ઉપર મુજબ કરવાનું થાય.

તા. ૧૪/૧૨/૨૦૨૦ના રોજ કોલેજ ઓફ એપ્લાઈડ સાયન્સ એન્ડ પ્રોફેસનલ સ્ટડીઝના ઈ.ચા.આચાર્યશ્રીની અરજી મળેલ છે. જેના અનુસંધાને તા.૨૩/૧૨/૨૦૨૦ અને તા.૧૮/૦૧/૨૦૨૧ની કાર્યાલયનોંધ રજુ કરવામાં આવી હતી. જેમાં સદર બાબતને એકેડેમીક કાઉન્સિલમાં રજુ કરવા આદેશ મળ્યા હતા. તા.૦૮/૦૩/૨૦૨૧ના રોજ સદર બાબતને એકેડેમીક કાઉન્સિલમાં રજુ કરવામાં આવી હતી. જે અન્વયે તા.૦૮/૦૩/૨૦૨૧નો ઠરાવ નીચે મુજબ થયેલો છે.

:: આથી ઠરાવવામાં આવે છે કે,

(૧) CGPA ની ગણતરી બધા સેમેસ્ટર પર કરવાની હોય પ્રથમ તથા દ્વિતીય વર્ષમાં YGPA CLASS ની જગ્યાએ સેકન્ડ તથા ફોર્થ સેમેસ્ટરમાં ફક્ત સેમેસ્ટર પૂરતું PASS/FAIL રીઝલ્ટ આપવું તથા FOM WITHDRAWN સિવાય અગાઉના સેમેસ્ટરમાં પ્રવેશ આપવો.

(૨) હાલની જેમ પાંચમાં સેમેસ્ટરમાં પ્રવેશ માટે પ્રથમ વર્ષ પાસ ન હોય તો સેમેસ્ટર-૪માં W.O.165 માં રીઝલ્ટ રોકવું. તથા છઠા સેમેસ્ટરમાં CGPA/CLASS આપવો.

(૩) સ્નાતકની જેમ અનુસ્નાતક કક્ષાએ પણ ઉપર મુજબ કરવાનું થાય.

(૪) જ્યાં અપેક્ષ બોડી /Professional Council ના નિયમ લાગુ પડતા ન હોય તેવા સ્નાતક કક્ષાના અભ્યાસક્રમો માટે સેમેસ્ટર ૧ અને ૩ તથા સેમેસ્ટર ૨ અને ૪ ની યુનિવર્સિટી પરીક્ષા વર્ષમાં એક જ વાર લેવાની રહેશે.

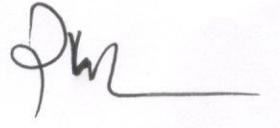
ઉપરોક્ત ઠરાવ અંગે સિન્ડીકેટને ભલામણ કરવામાં આવે છે.

ઉપરોક્ત બાબતને સિન્ડિકેટે એકેડેમીક વિભાગને વિચારણા કરવા માટે રીફરબેક કરવા જણાવેલ છે.

(પરીક્ષા વિભાગ)

:: આથી ઠરાવવામાં આવે છે કે, સિન્ડિકેટ તા. ૧૮/૦૫/૨૦૨૧ ના ઠરાવ ક્રમાંક : ૨૩ થી એકેડેમિક કાઉન્સિલને રીફરબેક કરવામાં આવેલ એકેડેમિક કાઉન્સિલના તા.૦૮/૦૩/૨૦૨૧ ના ઠરાવ ક્રમાંક : ૪ ના મુદ્દા ક્રમાંક : ૪ રદ કરવો તથા એક સેમેસ્ટરથી બીજા સેમેસ્ટર / એક વર્ષમાંથી બીજા વર્ષમાં જવા એ.ટી.કે.ટી. / ડીટેન્સન ના નિયમો યથાવત્ રાખવાનું ઠરાવવામાં આવે છે તથા સદર સુધારા સાથે તે મંજૂર કરવા સિન્ડિકેટને ભલામણ કરવામાં આવે છે.

ક્રમાંક : એ/એ.કા./કા.વા./૬૭૧૪/૨૦૨૧
તા.૨૧/૦૫/૨૦૨૧



ઈ.ચા.કુલસચિવ

પ્રતિ,

એકેડેમિક કાઉન્સિલના સર્વે સભ્યશ્રીઓ....

Master of Science (Computer Application) 2019-20

Name of Program	Master of Science (Computer Application)
Abbreviation	MSC(CA)
Duration	2 Years (Regular)
Eligibility	Candidate must have passed Bachelors Degree in Computer Science / Computer Application / Information Technology / Computer Engineering / equivalent degree in Computer / IT field.
Objective of Program	The Objective of the program is to impart knowledge of advanced and/or latest theories, concepts, methods, techniques and tools related to various areas of Computer Science, Applications and Information Technology and specifically in the area of Mobile based, cloud based, Web based Application Development, Software Engineering, Data Management and Intelligent Systems.
Program Outcome	At the successful completion of the program, students will be able to start their career in the Information Technology industry.
Program Structure	Semester 1

Course Code	Title	Teaching Hrs. per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
101	Advanced Software Engineering	4	0	4	3 Hrs	70	30	100
	Fundamentals of Artificial Intelligence							
102	Advance Database Management System	4	0	4	3 Hrs	70	30	100
103	Fundamentals of Web Client Technologies.	4	0	4	3 Hrs	70	30	100
104	Enterprise Data Management and ERP	4	0	4	3 Hrs	70	30	100
	Fundamentals of Big Data							
105	Web Programming Using Java	4	0	4	3 Hrs	70	30	100
106	Practical in Web Programming Using Java	0	4	4	4Hrs	70	30	100
107	Practical in Web Client Technologies	0	3	3	2 Hrs	70	30	100
108	Practical in Advanced Database Management System	0	3	3	2 Hrs.	70	30	100

			Semester -2					
Course Code	Title	Teaching Hrs. per week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
201	Service Oriented Architecture	4	0	4	3 Hrs	70	30	100
202	Web Programming Using C#	4	0	4	3 Hrs	70	30	100
203	Advanced Scripting Languages	4	0	4	3 Hrs	70	30	100
204	Data Warehousing and Data Mining	4	0	4	3 Hrs	70	30	100
	Internet of Things							
205	Information Security	4	0	4	3 Hrs	70	30	100
206	Practicals in Web Programming Using C#	0	4	4	2 Hrs	70	30	100
207	Practicals in Advanced Scripting Languages	0	4	4	2 Hrs	70	30	100
208	Practicals on Cryptography	0	2	2	2 Hrs	70	30	100

2nd Year Master of Science (Computer Application) 2020-21

			Semester 3						
	Course Code	Title	Teaching per week		Course Credits	University Examination		Internal Marks	Total Marks
			Theory	Practical		Duration	Marks		
	301	Advance PHP Programming	4	0	4	3 Hrs	70	30	100
	302	Mobile Application Development	4	0	4	3 Hrs	70	30	100
	303	Software Testing	4	0	4	3 Hrs	70	30	100
		AI Modeling with Python							
	304	Elective 1	4	0	4	3 Hrs	70	30	100
	305	Elective 2	4	0	4	3 Hrs	70	30	100
	306	Practicals on Advanced PHP Programming	0	3	3	2 Hrs	70	30	100
	307	Practicals on Mobile Application Development	0	4	4	2 Hrs	70	30	100
	308	Practicals on Software Testing	0	3	3	2 Hrs	70	30	100
		Practicals on AI modeling with Python							
	TOTAL		20	10	30		560	240	800

Elective 1 and 2 are to be selected from the following papers:

- a) Distributed Databases
- b) Multimedia Systems
- c) Advanced Artificial Intelligence
- d) Cyber Security and Forensics
- e) Search Engine Optimization and Digital Marketing

			Semester 4				
	Course Code	Title	Course Credits	University Marks	Internal Exam Marks	Total Marks	
	401	Project	24	280	120	400	
	402	Seminar	6	70	30	100	
	TOTAL		30	350	150	500	
	Program Passing Rules		As Per the University Norms of PG Rules				

Course : 301 : Advanced PHP Programming

Course Code	301
Course Title	Advanced PHP Programming
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2017
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool related to PHP for professional web application development , management and maintenance.
Course Objective	To Provide in-depth knowledge of most recent Open Source based server side programming technology.
Pr-requisite	Basic Understanding of Web, HTTP, HTML, Database Systems, Networks and Open Source Concepts
Course Out come	After completion of this course, the student will be capable to develop , manage and maintain professional web applications using PHP
Course Content	Unit 1 Codeigniter Framework 1.1 Introduction to Codeigniter: setup, Configuration files support, Application flow control and model-view-controller architecture 1.2 Codigniter URL s , Helper's file and URI routing, Codeigniter in-built libraries, Common functions, Error Handling 1.3 OOP in Codeigniter Unit 2 Web Application Development using Codignitor 2.1 Working with forms and validations 2.2 Cookies and Session Management 2.3 Using built in helpers for Email and SMTP support 2.4 Crud operation in Codeigniter using SQLite / MYSQL Unit 3 Working with images, pdf files and XML (with OOP/Codeigniter) 2.1 Working with images 2.1.1 Creating and manipulating images 2.1.2 Using Text in Images 2.1.3 Saving and building on existing image. 2.2 Generating PDF file with text, shapes and images. 2.3 PHP with XML 2.3.1 XML Introduction 2.3.2 Generating XML Document 2.3.3 Parsing XML Document Unit 4 Web services in PHP 4.1 Creating web services 4.2 Discovering web service 4.3 Accessing web services. 4.4 API integration using third-party libraries in Codeignitor (EX: Google Maps CI, LinkedIn API Wrapper , etc.) Unit 5 Laravel Framework 5.1 Introduction to Laravel, features and advantages 5.2 Composer installation for Laravel:

	5.2.1 Create Project in IDE 5.2.2 Setup Local Host file: Vhost Entry, httpd.conf, MOD Rewrite, Restart Apache 5.3 Application Structure : App, Console, Events, Exceptions, Http, Jobs, Listner, Config, Database, Resources, Storage, Vendor 5.4 Environment configuration , Setup the DB 5.5 Laravel Routing : Basic Routing, Route Parameters, Named Routes 5.6 Laravel Middleware , Request & Response 5.7 Laravel View & Blade template 5.8 Laravel Controllers & Redirecting. 5.9 Basic introduction to Database migrations and Eloquent Models
Reference Book	1. Programming with Codeigniter MVC BY Eli Orr and Yehoda Zadik, Shroff publication, ISBN – 13:978-93-5110-330-1 2. Codeigniter 1.7 by Jose Argudo Blanco and David Upton Shroff publication ISBN – 13:978-81-8404-606-0 3. The complete reference – PHP by Steven Holzner Mc Graw Hill ISBN – 13:978-0-07-0223622 4. AJAX and PHP: Building Modern Web Applications by Cristian Darie Second edition Packt publishing, ISBN: 1904811825, 9781904811824 5. XML and PHP by Vikram Vaswani SAMS Publishing ISBN - 0735712271, 9780735712270 6. PHP Web Services APIs for the Modern Web By Lorna Jane Mitchell O'Reilly Media, ISBN: 978-1-4493-5656-9 ISBN 10:1-4493-5656-7
Teaching Methodology	Discussion, Independent Study, Seminars / Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment / seminar, internal examination etc. 70% assessment is based on end semester written examination

Course: 302: Mobile Application Development

Course Code	302
Course Title	Mobile Application Development
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2017
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool of mobile application development using Android for development , management and maintenance of mobile device based application.
Course Objective	To Provide in-depth knowledge of most recent Mobile Devices Application Development technology.
Pr-requisite	Basic Understanding Java Programming, Object Oriented Concepts and Networks.
Course Out come	After completion of this course, the student will be capable to develop, manage and maintain professional mobile applications using Android
Course Content	Unit 1.Introduction To android 1.1 Architecture Of Android OS 1.2 Types Of Android Application - Foreground Applications, Background Services, Intermittent Applications, Widgets & Containers. 1.3 Components Of Android Application - Activities, Services, Broadcast Receivers, Content Providers 1.4 Application Lifecycle, Priority and States 1.5 Android Activity- Activity Lifecycle and Activity Stack 1.6 Android Development Tools 1.6.1. Android SDK and SDK Manager 1.6.2. The Android Virtual Device, Emulator 1.6.3. Dalvik Debug Monitor Service (DDMS) 1.6.4. Android Debug Bridge (ADB) 1.7 Introduction to cross-platform development using flutter Unit 2. Programming with Android 2.1 Directory Structure of Android Application 2.2 Creating And Working with Android Activities 2.3 Application Manifest 2.4 Creating User Interface 2.4.1. Fundamental UI Design 2.4.2. Layouts and its attributes 2.4.3. Drawable Resources 2.4.4 Fragments 2.5 Deploying Android Application Unit 3. Working with Data 3.1 Working with SQLite database 3.2 Shared Preferences-Creating, Saving, Retrieving Shared Preferences. 3.3 Creating and using Content Providers. 3.4 Working with Firebase Realtime Database Unit 4. Advanced Android Programming 4.1 Working with advanced UI controls 4.1.1 Working with Listviews - Simple Listview, Custom Listview 4.1.2. Working with Menus

	4.1.3 Working with Dialog classes - Alert dialog, Specialist input dialog, Using Activities as dialogs. 4.2 Working with Webview 4.3 Working with Intents-Intents, Linkify, Broadcast Receivers, Intent Filters 4.4 Working with Notifications Unit 5. Working with other Resources 5.1 Using Internet Resources, Services, Google App engine, Geocoder and Google Maps 5.2 Audio, Video and Using the Camera 5.2.1 Playing and recording Audio and Video 5.2.2 Working with the Camera
Reference Book	1. Professional Android 4 Application Development Reto Meier, WROX Publication-2015 2. Android for Programmers-An App Driven Approach, Deitel, Deitel, Deitel and Morgano, Pearson Publication-2012 3. Android Programming Unleashed, Harwani, Pearson Publication-2013 4. Professional Android Programming-with MONO McClure, Blevins, Croft, Dick and Hardy, Wiley India-2012 5. Android application development for java programmer, James C Sheusi, Cenage Learning-2013 6. Android Essentials, Chris Haseman, Apress Publication, 2009 7. Beginning Android, Mark L Murphy, Wiley India Pvt Ltd, 2009 8. Pro Android, Sayed Y Hashimi and Satya Komatineni, Wiley India Pvt Ltd, APress-2009
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course: 303: SOFTWARE TESTING

Course Code	303
Course Title	SOFTWARE TESTING
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2017
Purpose of Course	The course gives students an idea about Software Testing fundamentals and practice followed to test the software.
Course Objective	To Provide in-depth knowledge of most Software Testing and Industrial practices in it.
Pr-requisite	Basic Understanding of Programming and Software Engineering.
Course Out come	After completion of this course, the student will be capable of implementing the concepts, methods and tools of software testing.
Course Content	Unit -1 Software Testing 1.1 Role and objective of Testing, Central Issue in Testing, Testing Activities 1.2 Testing Approaches-Whitebox, Blackbox and Greybox 1.3 Levels of testing : Unit, Integration, System and Acceptance Unit 2: Types of testings 2.1 Code coverage-program statement and Line coverage, Branch coverage, condition Coverage, path coverage, function/procedure coverage 2.2 Data Testing-Testing for Boundary conditions, Sub-Boundary conditions, Default, Empty, Null, Zero, None, Invalid, Wrong, Incorrect, Garbage Data 2.3 Functional Testing: 2.3.1 Testing for Correctness, Completeness, Accuracy, Precision 2.3.2 Test to pass and test to fail 2.4 Behavioral Testing: State based testing, Testing for Stress, Load, Performance, Security 2.5 Regression testing, Smoke testing and Sanity Testing 2.6 Basics of Usability Testing, Configuration Testing and Compatibility Testing 2.7 Basics of Testing for Web & Mobile Applications Unit 3: Test Automation 3.1 Manual Testing Vs. Automated Testing 3.2 Criteria for Test Automation 3.3 Tool Selection and Introduction criteria 3.4 Cost Effectiveness of Tool Introduction 3.5 Types of test tools 3.5.1 Requirements and basic characteristic of Tool for Test management and Control 3.5.2 Requirements and basic characteristic of Tool for Test Case Generation 3.5.3 Requirements and basic characteristic of Tool for Test Execution 3.5.4 Requirements and basic characteristic of Tool for Regression Testing

	Unit 4 Test Automation Tools 4.1 Unit Testing with NUnit 4.1.1 NUnit framework, Test Fixture, Test, Setup & Tear Down, Asserts and Exception 4.1.2 Writing and executing testcases with NUnit 4.2 Unit Testing with JUnit 4.2.1 JUnit framework, Test Fixture, TestCase, Setup & Tear Down Asserts and Exception 4.2.2 Writing and executing testcases with JUnit 4.3 Functional Web Testing Using Selenium and Selenium Web Driver 4.3.1 Creating, Saving and Exporting TestCases and TestSuites 4.3.2 Test recording and playback using Selenium 4.3.3 Fundamentals of Selenium commands, parameters, element locators filters and string match patterns Unit 5: Other testing Tools 5.1 Test case generation Tool-case study of TestCaseGenerator 5.2 Tool for Bug Tracking- case study of Bugzilla 5.3 Tool for Test Management-case study of Tlink
Reference Book	1. Ron Patton “Software Testing”, Techmedia Publication, 2000 2. Dr. K.V.K.K prasad, “Software Testing Tools”, Dreamtech, 2006 3. Srinivas D and Gopalswamy R, “Software Testing: Principles and Practices”. Pearson Education, 2013 4. Rajiv Chopra, ”Software Testing- A Practical Approach”, 5. K. Mustafa and R.A Khan, “Software Testing -concepts and practices”, Narosa, 2012 6. Bill Hamilton, “NUnit: pocket Reference”, SDP-OREilly, , 2004 7. Andrew Hunt and David Thomas, “Pragmatic Unit Testing in Java with JUnit”, SPD, 2006 8. Aditya Garg and Ashish Mishra, “A Practitioner’s Guide to Test Automation using Selenium”, McGrawHill Education, 2015 9. S.A Kelkar, “ Software Quality and Testing- A Concise Study”,
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : 303 : AI Modeling with Python

Course Code	303
Course Title	AI Modeling with Python
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool related to python for modeling various AI applications.
Course Objective	◆ To learn Python programming and usage of various libraries ◆ To learn and implement Data processing and visualization routines ◆ To implement and evaluate various AI models in Python
Pr-requisite	Only those Students who have completed any one of the following courses can opt this course: 1) M.Sc(Comp. Appl). Sem-1- 101: Fundamentals of Artificial intelligence 2) M.Sc(Comp. Appl). Sem-II- 204: Datawarehousing and Data mining
Course Out come	After completion of this course, the student will be capable to model some AI applications using Python.
Course Content	Unit 1 Basic Python Libraries : Numpy and Pandas 1.1 Arrays and Vectorized Computation using NumPy 1.1.1 The NumPy ndarray: A Multidimensional Array Object 1.1.2 Universal Functions: Fast Element-wise Array Functions 1.1.3 Data Processing and File I/O with Arrays 1.2 Data Operations and Pre-Processing with Pandas 1.2.1 Operations on Data 1.2.2 Reading and Writing Data in Text Format 1.2.3 Summarizing and Computing Descriptive Statistics 1.2.4 Handling Missing Data, Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation, String Manipulation 1.2.5 Plotting and Visualization using Pandas Unit 2: Plotting and Visualization using Matplotlib 2.1 PyPlot and Plotting 2.2 Markers, Lines and Lables 2.3 Grids, Sublpots and Scatter Plots 2.4 Bars Histograms and Piecharts 2.5 Images, Contours and Fields 2.6 Working with Shapes, Collections and Stylesheets 2.7 Introduction to Animation and Event Handling in Matplotlib Unit 3 Modeling AI Applications in Python 3.1 Overview of Machine Learning 3.2 Supervised Learning and Classifiers 3.3 Model Train-Test and Learning Concepts, Model Evaluation 3.4 Modeling Supervised Machine Learning - Naive Bayes classifiers Modeling k-Nearest Neighbor 3.5 Modeling Decision Tree based classifier 3.6 Confusion Metrics Unit 4 Linear Models and Artificial Neural Networks 4.1 Regression, Generalization, Overfitting, and Underfitting, Relation of Model Complexity to Dataset Size 4.2 Linear Regression and its application

	4.3 Modeling Neural Network 4.2.1 Defining ANN in Python - layers and Multilayer Perceptron, weights, bias, Activation Function, Loss function, Epochs 4.2.2 Training and testing Neural Network, Feed Forward Neural Network, Backpropagation Neural Network, Error calculation Unit 5 Model Evaluation and Improvement 5.1. Cross-Validation and its benefits 5.1.1. Cross-Validation in scikit-learn 5.1.2. Stratified k-Fold Cross-Validation and Other Strategies 5.2. Evaluation Metrics and Scoring 5.2.1. Keep the End Goal in Mind 5.2.2 Metrics for Binary Classification, Multiclass Classification, Regression Metrics 5.2.3. Using Evaluation Metrics in Model Selection 5.2.4 Overview of Model Deployment
Reference Book	1. Core Python Programming – by Wesley J Chun ISBN-13: 978-0132269933 2. Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython , By William McKinney Publisher: O'Reilly Media 3. Pandas Cookbook Paperback – by Theodore Petrou (Author) 4. Python for Data Science for Dummies-By Mueller and Massaron, Wiley Publication 5. Introduction to Machine Learning with Python by Sarah Guido, Andreas C. Müller Publisher: O'Reilly Media, Inc. ISBN: 9781449369880 6. Machine Learning in Python-Michael Bowles, Wiley Publication 7. Machine Learning (in Python and R) for Dummies- By Mueller and Massaron, Wiley Publication 8. Python for Everybody: Exploring Data in Python 3, by Charles Severance (Author), Aimee Andrion (Illustrator), Elliott Hauser (Editor), Sue Blumenberg (Editor) 9. An Introduction to Python - by van Rossum Guido ISBN: 9780954161767, 0954161769 10 Python for everybody, Charles, Serverance, SPD 11. Python Programming using Problem Solving Approach-By Reema Thareja Oxford University Press 12. Introduction to Computer Science using Python-Charles Dierbach, Wiley Publication
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective - A - DISTRIBUTED DATABASE MANAGEMENT SYSTEM

Course Code	ELECTIVE B
Course Title	DISTRIBUTED DATABASE MANAGEMENT SYSTEM
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2015
Purpose of Course	The course gives students an idea about Distributed Database System and Query processing in Distributed Database System.
Course Objective	To provide comprehensive knowledge of Distributed Database Systems and aspect related to it.
Pre-requisite	Deep understanding of Database Management System concepts, Database Design, Database Management, Database Storage, Querying and Query Processing, Query Evaluation and Optimization and Object Oriented Concepts.
Course Out come	After completion of this course, the student will gain comprehensive knowledge of Distributed Database Systems and aspects related to it.
Course Content	Unit 1 Introduction to Distributed database Management System 1.1 Distributed data processing, What is a DDBMS? 1.2 Advantages and disadvantages of DDBMS. 1.3 Problem areas, Overview of database and computer network concepts 1.4 Architecture 1.5 Transparencies in a distributed DBMS 1.6 Distributed DBMS architecture Global directory issues Unit 2 Distributed Database Design 2.1 Alternative design strategies 2.2 Distributed design issues 2.3 Fragmentation, Data allocation Unit 3 Query Processing Issues & query optimization in distributed databases 3.1 Objectives of query processing, Characterization of query processors 3.2 Layers of query processing, Query decomposition 3.3 Localization of distributed data 3.4 Factors governing query optimization 3.5 Centralized query optimization, Ordering of fragment queries 3.6 Distributed query optimization algorithms Unit 4 Distributed Object Management and query processing 4.1 Object model features 4.2 Fundamental object management issues 4.3 DOM architectures 4.4 Object caching, Object clustering, Object migration 4.5 Distributed object base systems 4.6 Problems in accessing distributed objects 4.7 Goals of Distributed object assembly problem 4.8 Strategies for distributed object assembly

	Unit 5 Transaction Management in Distributed Databases 5.1 The concept of „transaction“ 5.2 Goals of transaction management, Characteristics of transactions 5.3 Taxonomy of transaction models
Reference Book	1. Principles of Distributed Database Systems - M.T. Özsu and P Valduriez – Prentice-Hall 2. Principles of Distributed Database Systems, 3rd edition - M.T. Özsu and P Valduriez – Springer , 2011 . 3. Distributed Object Management By Morgan Kaufman - M.T. Özsu and P Valduriez (editor) - 4. Distributed Databases Principles and Systems – S. Ceri and G.Pelagatti – Macgraw Hill Book Company ISBN : 5. Oracle 9i Distributed Database Replication Manual Modern Database systems. 6. The Object Model Interoperability and Beyond - W.KIM(editor) – APRESS 7. Advances in Object-Oriented Database Systems – A.Dogac, M.T Ozsu, A Billiris and T.Sellis (editors) - Springer–Verlag 8. Object Oriented Database System – Approaches & Architectures - C.S.R PRABHU - PHE Pub. 9. Fundamental of Database Systems 3rd edition – Elinisky & Navathe – Addison Welsey 10. Database Management Systems – Raghu Ramkrishnana and Johannes Gehrke – McGraw Pub.
Teaching Methodology	Discussion, Independent Study, Seminars / Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective -B MULTIMEDIA SYSTEMS

Course Code	ELECTIVE C
Course Title	MULTIMEDIA SYSTEMS
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2015
Purpose of Course	The course gives students an idea about Multimedia Systems .
Course Objective	The aim of this course is to provide knowledge of the basic concepts and techniques related to Multimedia System
Pre-requisite	Students should be familiar with basics of computer graphics and multimedia..
Course Out come	After completion of this course, the student will gain knowledge of basic concepts and techniques related to Multimedia System
Course Content	1. Computer graphics 1.1 Fundamentals 1.2 Vector graphics 1.3 Shapes 1.4 Transformations and Filters 1.5 3-D Graphics 1.6 Bitmapped graphics 1.7 Resolution 1.8 Image Manipulation 1.9 Geometrical Transformation 1.10 Combining Vectors and Bitmaps 1.11 File Formats 2. Video & Animation 2.1 Digitizing Video 2.2 Video Standards 2.3 Video Compression techniques 2.4 Digital Video Editing and Post-Production 2.5 Streamed Video and Video Conferencing 2.6 Captured Animation and Image Sequences 2.7 „Digital Cel□ and Sprite Animation 2.8 Key Frame Animation 2.9 3-D Animation 3. Sound 3.1. The Nature of Sound 3.2. Digitizing Sound 3.3. Processing Sound 3.4. 4.4 Compression 3.5. Formats 3.6. MIDI 3.7. Combining Sound and Picture

	4. Distributed Multimedia system 4.1. Operating System Introduction to DMS 4.2. Main Features of DMS 4.3. Resources Management of DMS 4.4. Networking 4.5. Multimedia 4.6. Distributed Multimedia Servers 4.7. Distributed Multimedia Application 5. Multimedia Data Compression 5.1 Data Compression Terminology 5.2 A Classification of Data Compression Terminology 5.3 Data Compression Technology 5.4 Compression Standards 5.5 Image Compression 5.6 Video compression 5.7 Audio compression
Reference Book	1. Digital multimedia 3/e illustrated – Chapman, Nigel P. Chapman, Jenny Chapman – Wiley , 2009 2. Multimedia – Making it Work – Tay Vaudhan Tata Mcgraw Hill ISBN 3. Streaming Multimedia – Steve Mack - John Wiley 4. Multimedia Communication System - LPE Pearson – Education Publication.
Teaching Methodology	Discussion, Independent Study, Seminars /Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective -C Advanced Artificial Intelligence

Course Code	ELECTIVE D
Course Title	Advanced Artificial Intelligence
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	--
Purpose of Course	The course gives students advanced knowledge of AI systems and applications
Course Objective	◆ To learn and understand AI and Expert systems ◆ To learn and understand AI in Natural language processing & Translation ◆ To learn and understand AI for Computer Vision and Robotics
Pre-requisite	Only those Students who have completed the following course can opt this course: 1) M.Sc(Comp. Appl). Sem-1- 101: Fundamentals of Artificial intelligence
Course Out come	After completion of this course, the student will gain knowledge of AI systems and applications like Expert Systems, Natural Language Processing, Computer Vision and Robotics
Course Content	Unit 1: Expert Systems 1.1 Overview of Expert System, Characteristics, Development of Expert System and Technology, Domains and applications, Elements of an Expert System, Production system, Artificial Neural System 1.2 Design of Expert System - Stages in development of an Expert System, Software Engineering and Expert System, The Expert System Life Cycle, Expert System Life Cycle Model, 1.3 Expert System Architecture - Overview of expert System Tools, Expert System Shells, Black Board Architecture, Truth Maintenance Architecture System, Rule Induction by Machine Learning Unit 2: Natural language processing 2.1 Introduction - Communication as action, fundamentals of language, the component steps of communication, 2.2 Language Models - <i>N gram</i> character models, model smoothing, model evaluation, <i>N gram</i> word models 2.3 Text Classification 2.4 Information Retrieval - IR scoring functions, IR system evaluations, IR refinements, The PAGERANK algorithm, The HITS algorithm, Question answering 2.5 Information Extraction - Finite state automata for IE, Probabilistic models for IE, Conditional Random fields for IE, Ontology extraction from large corpora, Automated template construction, Machine Reading Unit 3: Natural language for Communication 3.1 Introduction - Communication as action, fundamentals of language, Grammar Formal isms and their generative capacity, the component steps of communication, 3.2 Phrase structure Grammars - The lexicon of E0, The grammar of E0, 3.3 Syntactic Analysis(Parsing) - CYK algorithm, Learning probabilities for PCFGs 3.4 Augmented Grammars and Semantic Interpretation - Lexicalized PCFGs, Augmented Grammar Rules, Case agreement and subject-verb agreement, Semantic interpretation, Complications in grammar of real English 3.5 Machine Translation-machine translation systems, Statistical machine translation, 3.6 Speech Recognition - Acoustic model, Language model, Building a

	speech recognizer Unit 4. Perception 4.1 Image Formation-The pinhole camera, Lens systems, Scaled Orthographic projection, Light and Shading, Color 4.2 Early Image-Processing Operations - Smoothing, Edge detection, Texture, Optical flow, Image segmentation 4.3 Object Recognition by Appearance-Complex appearance and pattern elements, pedestrian detection with HOG features 4.4 Reconstructing the 3D World - Motion parallax, Binocular stereopsis, Multiple views, Texture, Shading, Contour, Objects and geometric structures of scenes 4.5 Object Recognition from Structural Information - The geometry of bodies, Coherent appearance 4.6 Using Vision- The problem of image tagging/annotation, Reconstruction from many views, Using vision for controlling movement 5. Robotics 5.1 Introduction 5.2 Robot Hardware-Sensors, Effectors 5.3 Robotic Perception - The problems of state estimation, Localization and mapping, other types of perceptions, machine learning in robot perception, 5.4 Planning to Move - Configuration space, Cell decomposition methods, Modified cost functions, Skeletonization methods, 5.5 Planning Uncertain Movements- Robust methods 5.6 Moving - Dynamics and control, Potential field control, Reactive control, Reinforcement learning control, 5.7 Robotic Software Architectures - Subsumption architecture, Three-layer architecture, Pipeline architecture 5.8 Application Domains of robotics
Reference Book	1. Artificial Intelligence –A Modern Approach (2nd Edition/ 3rd Edition) - by Stuart J. Russell and Peter Norvig, Pearson Education 2. Artificial Intelligence-Building Intelligent Systems- By Kulkarni and Joshi, PHI 3. Artificial Intelligence - By Anamitra Deshmukh-Nimbalkar and Manmohan Singh, Technical Publications 4. Introduction to AI Robotics - By Robin Murphy, PHI 5. Natural Language Processing and Information Retrieval-By bSiddiqui and Tiwari, Oxford University Press 6. Speech and Language Processing - By Jurafsky and Martin, Pearson Education 7. Introduction to Artificial Intelligence and Expert Systems – Dan W. Patterson –PHI 8. Foundation of Artificial Intelligence and Expert Systems – By V.S Janakriraman, K.Sarukesian and P.Gopalkrishnan – Macmillan 9. Expert Systems : Principles and Programming – By Joseph C Giarratano, Gary D Riley Course Technology 10 Introduction to Expert Systems – By Peter Jackson – Addison Wesley Publishing Company
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based practical examination at the end of semester.

Course: Elective D- Cyber Security and Forensic

Course Code	Elective E
Course Title	Cyber Security and Forensic
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2017
Purpose of Course	The course gives students Understanding about major concept of Cyber Security and Forensic
Course Objective	To provide fundamental knowledge of Cyber crimes, Cyber security and Computer Forensics.
Pr-requisite	Basic Understanding of Networking , Web Application, Relational Database, Mobile Application
Course Out come	After completion of this course, the student will gain comprehensive knowledge of Cyber security and Forensic and aspects related to it.
Course Content	Unit 1 Introduction to Cyber Crime and Cyber offences 1.1 Introduction of Cybercrime:- Definition, Cyber Crime and Information Security, Types and Category of Cyber Crime 1.2 Techniques of CyberCrimes 1.2.1 E-Mail Spoofing, Spamming, Cyberdefamation, Salami Attack, Data diddling, Hacking, Online fraud, Software Piracy, computer Sabotage, Email Bombing, Computer Network Intrusions, Password Sniffing, Credit Card Frauds 1.3 How Criminal Plans Attacks 1.3.1 Reconnaissance Attack, Passive Attack, Active Attack, Scanning/ Scrutinizing information, Gaining and Maintaining the system Access 1.3.2 Cyberstalking:- Types of Cyberstalking cases of cyberstalking, How Stalking works 1.3.3 Botnets:- The fuel of cybercrime, Botnet Attack. 1.3.4 Honeypot Unit 2 Cyber Crime: Mobile and Wireless Devices 2.1 Introduction 2.1.1 Proliferation of Mobile and Wireless Devices, 2.1.2 Trends in Mobility, 2.1.3 Credit Card Frauds in Mobile and Wireless Computing , 2.1.4 Types and Techniques of Credit Card Frauds 2.2 Security Challenges 2.2.1 Security Challenges by Mobile Devices, Registry Settings for Mobile devices 2.2.2 Authentication Services Security Cryptographic Security For Mobile Devices, LDAP Security of Hand-Held Mobile computing devices 2.2.3 RAS Security for mobile devices, Media Player Control Security, Networking API Security for Mobile Computing Applications 2.3 Attacks on Mobile Cell Phones 2.3.1 Mobile Phone Theft,

2.3.3 Mobile Viruses Mishing, Vishing, Smishing

2.3.2 Hacking Bluetooth

2.4 Security Implication for Organization

2.4.1 Managing Diversity and Proliferation of Handheld devices,

2.4.2 Unconventional Storage Device threat through stolen devices

2.4.3 Protecting Data on lost devices

2.5 Organizational Measures for handling Mobile devices

2.5.1 Security issues , Encrypting Organizational database including mobile devices and security strategy

2.5.2 Organizational security policies for mobile computing Devices

2.5.3 Operating guidelines for implementing mobile Security policies

2.5.4 Organizational policies for use of Mobile, Handheld devices Laptops and Physical Counter measures

Unit 3: Tools and Methods used in Cyber Crimes

3.1. Proxy Server and Anonymizers

3.2 Phishing: How phishing works

3.2.1 Password Cracking:-Online Attack, offline Attacks Strong, weak and Random Passwords

3.3 Keyloggers and Passwords

3.3.1 Software Keyloggers

3.3.2 Hardware Keyloggers,

3.3.3 Antileyloggers

3.3.4 Spywares

3.4 Penetration testing tools:

3.4.1 NMAP, External and internal network scanning,

3.4.2 WIFI Penetration testing.

3.5 Cloud Security

3.6 IoT Security

3.7 Securing and processing the evidence

3.7.1 Incident handling steps & process

3.7.2 Creating duplicate images of storage media

3.7.3 Investigating Website & web application

3.7.4 Tracing the activity of target computer

3.7.5 Registering and processing cyber crime complaint

Unit 4 Computer Forensics

4.1 History of Cyberforensic and Digital Forensic

4.2 Need of Computer Forensic

4.3 Cyberforensics and Digital Evidence

4.4 Digital Forensic Life cycle

4.5 Forensic Analysis of Email

4.6 Network Forensic Importance of OS1-7 layer to computer forensic

4.7 Computer Forensic Investigation

4.8 Computer Forensic and Steganography

4.9 Analysis of CCTV Footage

4.10 computer forensics security or privacy threat

4.11 OS Forensic: Windows forensics, Android and IOS forensic

4.12 Analysis of Audio evidences, Analysis of Image and Video evidences

4.13 Introduction to Blockchain and Cryptocurrencies

	4.14 Legal admissibility of multimedia evidences 4.15 Compliance perspective for Computer forensic 4.16 Challenges, Special Tools and Technique 4.17 Cyber Security Audit and Compliance Unit 5: Forensic of Hand Held Device 5.1 Understanding cell phone working characteristics 5.2 Hand Held devices and digital forensic 5.2.1 Mobile Phone Forensic 5.2.2 PDA Forensic 5.2.3 Printer and scanner forensic 5.2.4 Smartphones and iPhones forensic 5.2.5 Toolkits for handheld Devices Forensics
Reference Book	1 . Cyber Security Understanding cyber crimes computer forensics and legal Perspectives by Nina Godbole , Sunit Belapur by Wiley India Publications . 2. Internet Forensic Using Digital Evidences to Solve Computer Crime by Robert Jones O'Reilly October 2005. 3 . Windows Forensic The Field Guide for conducting Corporate computer Investigations by Chad Steel Wiley India Publications. 4. Digital Evidence and Computer Crime by Eoghan Casey Academic Press 2011 3rd Edition . 5. Cyber Crimes and Fraud Management by Mr. Petrick Kishore, macmillan education
Teaching Methodology	Classroom Discussion, Independent Study, Seminars / Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : Elective -E SEARCH ENGINE OPTIMIZATION AND DIGITAL MARKETTING

Course Code	ELECTIVE F
Course Title	SEARCH ENGINE OPTIMIZATION AND DIGITAL MARKETTING
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	-
Purpose of Course	To provide comprehensive knowledge about theory behind Search Engine Optimization and search engine working
Course Objective	To provide the student sufficient knowledge to learn steps, need ,execute and evaluate the Search Engine Optimization initiatives and prepare them for Digital Marketing
Pr-requisite	Fundamental Knowledge about Web Development, Searching Technologies and Metadata
Course Out come	After completion of this course, the student will gain comprehensive knowledge of Search engines and their working and various search engine optimization techniques and will be ready to work in the field of Digital Marketing
Course Content	Unit 1 Search Engine and Ecommerce 1.1 Mission of Search Engine 1.2 Human Goals of Searching, Determining searcher intent. 1.3 Challenges for Marketer and search engine 1.3.1 People search, 1.3.2 Search engine drive ecommerce on web 1.4 Eye Tracking:- User Scans Results pages, Click Tracking Unit 2 Search Engine Basic, SEO objectives 2.1 SEO Objectives 2.2 Anatomy of a Search Engine 2.2.1 Query interface 2.2.2 Crawlers, spiders, and robots 2.2.3 Databases 2.3 Identifying Site Development Process 2.3.1 Defining Site information Architecture 2.3.2 Auditing current site and Identify SEO problem 2.3.3 Identifying Current Server Statistics Software 2.3.4 Determine Top Competitor 2.4 Theory of Keyword Search 2.4.1 Keyword Research Tools 2.4.2 Leveraging of Long Tail of Keyword Demand 2.4.3.Keyword Demand :- Seasonality, Trending, Seasonal Fluctuation Unit 3 Tracking the Result and Measuring Success 3.1 Measuring Success of SEO Process 3.2 Measuring Search Traffic 3.3 SEO Tools - Google Webmaster Tools and Google Analytics 3.4 Google Webmaster Tools - Webmaster Tools Setup, Dashboard, The “Site configuration” Section, The “Your site on the web” Section, The Diagnostics Section 3.5 Google Analytics- Installation and Setup, Navigating Google Analytics, Dashboard, Traffic Sources, Content, Goals, Google Analytics Shortcomings Unit 4 Digital Marketing Fundamentals 4.1 Marketing v/s Sales, Inbound v/s Outbound marketing

	4.2 Content marketing, Strategic flow for marketing activities Understanding Leads 4.3 Facebook Marketing Fundamentals 4.3.1 Profiles and Pages, Business Categories 4.3.2 Creating Facebook Pages, Page Info and Settings , Facebook Page Custom URL, Invite Page Likes 4.3.3 Facebook Events, Facebook Insights Reports 4.4 Affiliate marketing Unit 5 YouTube Marketing and Email Marketing 5.1 Video Flow 5.2 Google Pages for YouTube Channel 5.3 Verify Channel and Linking Custom Channel URL 5.4 Uploading Videos, Uploading Defaults Creator Library, Live Broadcasting and Practical Examples 5.5 Email Marketing, Content writing, Email Software and Tools
Reference Book	1. The Art of SEO : Mastering Search Engine Optimization by Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola O□ REILLY Publication 2nd edition 2. The Art of SEO : Mastering Search Engine Optimization by Eric Enge, Stephan Spencer, Rand Fishkin, Jessie C Stricchiola O□ REILLY Publication 3rd edition 3. SEO Search Engine Optimization Bible by Jerri L Ledford 2nd Edition Wiley India 4. SEO Warrior : Essential Techniques for Increasing Web Visibility by John I Jerkovic O□ Reilly Publication 5. Search Engine Optimization For Dummies by Peter Kent John Wiley and Son 5th Edition 6. Digital Marketing -by Seema Gupta. McGrawHill, Second Edition 7. The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaigns by Ian Dodson , Wiley Publication 8. Digital Marketing For Dummies by Russ Henneberry, Ryan Deiss, For Dummies Publication
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : 306 Practicals on Advanced PHP Programming

Course Code	306
Course Title	Practicals on Advanced PHP Programming
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods and tools learnt in course 301 Advanced PHP Programming.
Course Objective	The Objective of these course is to to enable students to develop web applications in PHP
Pr-requisite	Programming Skill in Structured and Object Oriented Programming, Scripting Skills in HTML, Basics of Operating Systems, Networks and Database systems, Concepts of Web, HTTP etc.
Course Out come	After completion of this course, the student will be capable of developing professional web applications using PHP.
Course Content	The students will be required to carry out practical in Web Application Development on the topics covered in Paper 301: “Advanced PHP Programming” using the methods and tools discussed there in. A Journal must be prepared for the practical work done.
Reference Book	As Per Paper 301
Teaching Methodology	Lab Work
Evaluation Method	30% Internal assessment is based on Practical attendance, problem solving and , internal examination etc. 70% assessment is based practical examination at the end of semester.

Course : 307 Practicals on Mobile Application Development

Course Code	307
Course Title	Practicals in Mobile Application Development
Credit	4
Teaching per Week	4 hours
Minimum weeks per Semester	15 (Project work, Self-Study, examination, preparation, holidays etc.)
Review / Revision	--
Purpose of Course	The purpose of the course is to make students capable of developing professional applications using latest tools and technologies of Mobile Application Development.
Course Objective	To expose students to industrial practices and activities of software engineering and train them about the same using Mobile Application Development Tools and Technologies.
Pre-requisite	Knowledge of Advanced Programming, Latest Technologies and Tools and Software Engineering
Course Out come	After completion of this course, the student will be capable of developing professional applications using latest tools and technologies of Mobile Application Development.
Course Content	The students will be required to carry out practical in Mobile Application Development on the topics covered in Paper 302: “Mobile Application Development” using the methods and tools discussed there in. A Journal must be prepared for the practical work done.
Reference Book	As per Paper:302 Mobile Application Development
Teaching Methodology	LabWork
Evaluation Method	30% Internal assessment is based on project presentation and/or demonstration and viva-voice examination. 70% assessment is based Project Presentation and/or demonstration and viva-voice examination at the end of semester.

Course : 308 Practical on Software Testing

Course Code	308
Course Title	Practical on Software Testing
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2017
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques of software testing learnt in course 303 Software Testing
Course Objective	The Objective of these course is to enable students to Test desktop and Web Applications.
Pr-requisite	1) Basic understanding of Programming and Software Engineering 2) Only those students must have studied one of the following courses can opt this course: ◆ M.Sc(Comp. Appl). Sem-3- 303 : Software Testing
Course Out come	After completion of this course, the student will be capable of performing various types of testing on Software and Web Applications.
Course Content	The students will be required to carry out practical on Software Testing on the topics covered in Paper 303: “Software Testing” using the methods and tools discussed there in. A Journal must be prepared for the practical work done.
Reference Book	.As per paper 303 - Software Testing
Teaching Methodology	Lab Work
Evaluation Method	30% Internal assessment is based on Practical attendance, Problem Solving, internal examination etc. 70% assessment is based practical examination at the end of semester.

Course : 308 Practicals on AI modeling with Python

Course Code	308
Course Title	Practicals on AI modeling with Python
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2019
Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques of software testing learnt in course 303 AI modeling with Python
Course Objective	The Objective of these course is to enable students to : ◆ To learn Python programming and usage of various libraries ◆ To learn and implement Data processing and visualization routines ◆ To implement and evaluate some AI models in Python
Pr-requisite	1) Basic understanding of Programming and fundamentals of AI or Supervised Learning 2) Only those students must have studied the following courses can opt this course: M.Sc(Comp. Appl). Sem-3- 303 : AI modeling with Python
Course Out come	After completion of this course, the student will be capable of performing various types of testing on Software and Web Applications.
Course Content	The students will be required to carry out practical on Software Testing on the topics covered in Paper 303: “AI modeling with Python” using the methods and tools discussed there in. A Journal must be prepared for the practical work done.
Reference Book	.As per paper 303 - AI modeling with Python
Teaching Methodology	Lab Work
Evaluation Method	30% Internal assessment is based on Practical attendance, Problem Solving, internal examination etc. 70% assessment is based practical examination at the end of semester.

Course : 401 Project

Course Code	401
Course Title	PROJECT
Credit	24
Teaching per Week	20 hours (i.e. 2 Students / hour / Week)
Minimum weeks per Semester	15 (Project work, Self-Study, examination, preparation, holidays etc.)
Last Review / Revision	June 2013
Purpose of Course	Students will get trained in industrial practices and activities of Software Engineering
Course Objective	To expose students to industrial practices and activities of software engineering and train them about the same
Pr-requisite	Knowledge of Advanced Programming, Latest Technologies and Tools and Software Engineering
Course Out come	After completion of this course, the student will be capable to start professional career and/or research work in the field of Information Technology
Course Content	Entire semester is allocated for a full-time project work. All the students have to undergo a project preferably in an industry or any reputed institute. The students must prepare documentation of the project work done as per the software Engineering Guidelines. At the end of the semester, the students have to submit their project report in bounded form to the respective institution. The project presentation and viva – voice will be conducted on the basis of it. The students have to submit the following reports to their respective institution: 1. Project Joining Report 2. Appropriate name of the project 3. Monthly Progress Report duly sign by the concern external guide 4. Project Completion Certificate 5. Institution/College Certificate 6. Software Coding declaration...(if industry/organization doesn't permit students to submit the source code) (To be submitted at the time of joining project training) 7. Attendance Report Without such reports student will not be allowed to appear in his/her final Project Presentation and Viva-Voice
Reference Book	.---
Teaching Methodology	Project guidance, review
Evaluation Method	30% Internal assessment is based on project presentation and/or demonstration and viva-voice examination. 70% assessment is based Project Presentation and/or demonstration and viva-voice examination at the end of semester.

Course : 402 Seminar

Course Code	402
Course Title	SEMINAR
Credit	6
Teaching per Week	10 hours (i.e. 4 Students / hour / Week)
Minimum weeks per Semester	15 (Project work, Self-Study, examination, preparation, holidays etc.)
Review / Revision	June 2015
Purpose of Course	The purpose of the course is to make student capable of gaining additional knowledge (besides the curricula) in the field of information technology by self learning practices and presenting and/or demonstrating it .
Course Objective	Additional knowledge building in the field of Information Technology using self-learning practice.
Pr-requisite	Basic Knowledge of Information Technology theories, activities, methods, techniques & tools
Course Out come	After completion of this course, the student will have gained some additional knowledge (besides the curricula) in the field of information technology by self learning practices and will be capable of presenting and/or demonstrating it
Course Content	In this paper students will have to select any topic related to information technology field– preferably based on the current trends and technologies for the seminar. Individual student is required to prepare a seminar report. At the end of the semester student has to submit seminar report with satisfactory detail study in the bounded form to the respective institution. The seminar presentation and viva voice will be conducted on the basis of selected topic at the end of the semester. The students have to submit the following documents to their respective institution: 1. Name and abstract of the Topic selected. 2. Monthly Progress Report duly signed by the concern internal guide 3. Work Completion Certificate by internal guide 4. Institution/College Certificate
Reference Book	.-----
Teaching Methodology	Seminar Guidance and Report
Evaluation Method	30% Internal assessment is based on seminar presentation and viva-voice examination. 70% assessment is based on seminar presentation and viva-voice examination at the end of semester

Veer Narmad South Gujarat University

Teaching and Evaluation Scheme

MCA 3rd Semester (Web Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things	4	0	4	3 Hrs	70	30	100
	Machine Learning							
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	Advanced Web Technologies	4	0	4	3 Hrs	70	30	100
	Advanced Java Programming							
304	Full Stack Technology	4	0	4	3 Hrs	70	30	100
305	Open Source Web Based Programming	4	0	4	3 Hrs	70	30	100
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 3rd Semester (Database Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things	4	0	4	3 Hrs	70	30	100
	Machine Learning							
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	ERP Using SAP	4	0	4	3 Hrs	70	30	100
	NoSQL Databases							
304	Advanced Database Administration	4	0	4	3 Hrs	70	30	100
305	Data Warehousing and Data Mining	4	0	4	3 Hrs	70	30	100
	Big Data							
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 3rd Semester (Network Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things	4	0	4	3 Hrs	70	30	100
	Machine Learning							
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	Network Essential & its Security	4	0	4	3 Hrs	70	30	100
304	Network Administration	4	0	4	3 Hrs	70	30	100
305	Wireless Network & Mobile Computing	4	0	4	3 Hrs	70	30	100
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 3rd Semester (General Group)

Course Code	Title	Teaching per week		Course Credits	University Exam		Internal Exam	Total Marks
		Theory	Practical		Duration	Marks		
301	Internet of Things	4	0	4	3 Hrs	70	30	100
	Machine Learning							
302	Design Patterns	4	0	4	3 Hrs	70	30	100
303	Network Essential & its Security	4	0	4	3 Hrs	70	30	100
304	Advanced Database Administration	4	0	4	3 Hrs	70	30	100
305	Open Source Web Based Programming	4	0	4	3 Hrs	70	30	100
306	Programming Skills VIII	0	2	2	2 Hrs	70	30	100
307	Programming Skills IX	0	3	3	2 Hrs	70	30	100
308	Programming Skills X	0	2	2	2 Hrs	70	30	100
309	Programming Skills XI	0	3	3	2 Hrs	70	30	100

MCA 4th Semester

Teaching and Evaluation Scheme

Paper	Title	Credits	University Exam Marks	Internal Exam Marks	Total Marks
401	Seminar	6	70	30	100
402	Project	24	280	120	400

MCA 3rd Sem.

(Web

Group)

Course: 301: Internet of Things (IoT)
(Elective)

Course Code	301
Course Title	Internet of Things (IoT)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 1. To make student understand IoT 2. To understand the working of Micro-Controller & Micro-Computer 3. To explain various types of sensors 4. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	Unit 1: Introduction to IoT 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet Unit 2: Networking and Communication 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS Unit 3: Sensors 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network Unit 4: Micro-Controller: Arduino, NodeMCU 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture 4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU

	4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout Unit 5: IoT App Interaction & Introduction to Raspberry Pi 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madisetti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: Machine Learning
(Elective)

Course Code	301
Course Title	Machine Learning (ML)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Unit 1 : Introduction 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance Unit 2 : Data Wrangling 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization Unit 3 : Supervised Learning 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour 3.3.2 Support Vector Machines

	3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine Unit 4 : Neural Network 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network Unit 5 : Unsupervised Learning 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: Design Patterns

Course Code	302
Course Title	Design Patterns
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 1. To study various Design Patterns 2. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	Unit -1 Creational Patterns 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern Unit-2 Structural Patterns 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern Unit-3 Behavioural Pattern 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern Unit-4 Additional Design Patterns 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern Unit-5 Pattern Applicability 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore 5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud

	Self-Study : Pattern Languages
Reference Books	1. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addison Wesley 2. Head First Design Patterns, Eric Freeman, O'Reilly 3. Design Patterns in C#, Vaskaran Sarcar, Apress 4. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 5. Modern C++ design: generic Programming and design patterns applied, Alexandrescu, Andrei, Addison-Wesley 6. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: Advanced Web Technologies
(Elective)

Course Code	303
Course Title	Advanced Web Technologies
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To teach ASP .Net for web application development
Course Objective	To impart knowledge of web application development using ASP .Net
Pre-requisite	Fundamental of .Net framework, HTML and C# desirable
Course Out come	Students will be able to development web application using ASP .Net
Course Content	Unit : 1 : Introduction to ASP.NET 1.1. Overview of ASP.NET 1.2. Page Class and Page Life Cycle 1.3. Web Configuration files 1.4. Exception Handling 1.5. Error Pages 1.6. ASP.NET State Management 1.7. Introduction to Caching Unit : 2 : ASP.NET Controls 2.1 Web Controls 2.1.1 Common Web Server Controls 2.1.2 Specialized Web Server Controls 2.1.3 Table, Image, FileUpload 2.1.4PostBack / AutoPostBack 2.2 Validation and Rich Controls 2.3 Website Navigation Controls - Sitemap, Treeview, Menu Controls 2.4 ASP.NET AJAX Controls 2.4.1 Introduction 2.4.2 Server Callbacks / Script Manager 2.4.3 ASP.NET AJAX Server Controls 2.4.4 UpdatePanel Unit : 3 : ASP .NET Web Application with Database 3.1. ADO.NET Architecture 3.2. Direct Data Access 3.3. Disconnected Data Access 3.4. Data Binding & Data Controls 3.4.1. Single-view, Repeated-Value, Data Source 3.4.2. Grid view ,Detail View, Form View 3.4.3. Data Repeater Control 3.5. LINQ 3.5.1. LINQ Language Features 3.5.2. LINQ to Objects 3.5.3. LINQ to SQL Unit : 4 : ASP .NET - MVC , WCF Services & API 4.1. ASP.NET MVC 4.1.1. MVC Architecture 4.1.2. URL Routing Engine 4.1.3. Wiring Controller, Model, and View 4.1.4. Data Access 4.1.5. Introduction to Entity Framework 4.2. WCF Services 4.2.1. Introduction to Web Services 4.2.2. RESTful API

	4.2.3. Working with WCF Services 4.3. API 4.3.1. Introduction to JSON 4.3.2. Web API 4.3.3. API Creation and Consumption Unit : 5 : ASP.NET CORE 5.1. Overview of C#.NET CORE 5.2. .NET CORE Assemblies and Libraries 5.3. Pattern Matching 5.4. Tuples and Deconstruction 5.5. Local/Nested Functions 5.6. NuGet Package
Reference Book	1. Professional ASP.NET, Wrox Publication 2. ASP.NET – From Novice to Professional, Wrox Publication 3. ASP.NET Bible, By Mridula Parihar 4. Beginning ASP.NET 4.5, Wrox Publication 5. ASP.NET MVC with Entity Framework and CSS, APress 6. Programming Microsoft ASP.NET, Microsoft Press 7. Beginning AJAX with ASP.NET, Wrox Publication 8. Professional ASP.NET MVC 5, Wrox Publication 9. Professional C# 7 and .NET Core 2.0 , Wrox Publication 10. ASP.NET Core 2 Fundamentals, Packt Publication 11. Pro ASP.NET MVC 5, Apress 12. Programming ASP.NET Core, Microsoft Press 13. Pro C# 7 with .NET and .NET Core, Apress 14. Pro ASP.NET Core MVC by Adam Freeman, Springer, 2016
Teaching Methodology	Classroom, seminar and assignment
Evaluation Method	As per University rules

Course: 303: Advanced Java Programming
(Elective)

Course Code	303
Course Title	Advanced Java Programming
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	This course is advance level java course to learn web & web enabled application development using Java Technologies.
Course Objective	To develop web application skills using Java web technology
Pre-requisite	Core Java, Object oriented Programming
Course Outcome	After studying this students will be able to understand how to develop web application. This course will also help students to know various java web servers available. After successful completion students will be able to develop web applications using java.
Course Content	Unit 1: Advance JDBC (Java Database Connectivity) 1.1 Types of JDBC Drivers 1.2 Connecting to databases like Access, MySQL, SqlServer, Oracle 1.3 Interacting with Database using SQL Queries 1.4 JDBC Objects: Connection, Resultset, Statement, Metadata 1.5 More JDBC Objects: DataSource, RowSet, RowSet events 1.6 Calling Stored Procedures 1.7 Managing Transactions 1.8 JDBC Connection Pooling 1.9 Handling Errors/Warning Unit 2: Java Servlets 2.1 Introduction to Servlets 2.2 Servlet Lifecycle 2.3 Handling HTTP GET and POST requests 2.4 Invoking other web resources 2.5 Maintaining client state 2.6 Servlet Annotations 2.7 Servlet Filter 2.8 File Upload Unit 3: Java Server Pages(JSP), JSTL (Standard Tag Library) & EL 3.1 Introduction to JSP, page lifecycle 3.2 JSP Elements – directives, scriptlet, action 3.3 Implicit JSP objects 3.4 Using JavaBeans in JSP, Session Tracking 3.5 JSTL – Using Java Standard Tag Library 3.6 JSTL Core & Database tags 3.7 Introduction to EL (Expression Language) 3.8 EL implicit objects Unit 4: Web Services with XML & JSON 4.1 Introduction to Web Services 4.2 Building XML based web services with JAX-WS 4.3 Building Restful web services with JAX-RS 4.4 Reading/Writing XML files in Java (JAXP) 4.5 Introduction to AJAX

	Unit 5: JPA, EJB & MVC Introduction 5.1 Introduction to Java Persistence API (JPA) 5.2 Entity Beans & Session Beans 5.3 Overview of MVC Framework 5.4 Spring Architecture 5.5 Spring XML Configuration 5.6 Aspect oriented programming
Reference Books	1. Java EE Tutorial Basic Concepts by Oracle Corporation 2. Beginning Java™ EE Platform with GlassFish™ : From Novice to Professional by Antonio Goncalves 3. Beginning EJB 3 Application Development From Novice to Professional by Raghu R.Kodali and Jonathan Wetherbee with Peter Zadrozny, Apress Publication 4. Pro JPA 2: Mastering the Java™ Persistence API 5. Head First Servlets and JSP By: Bryan Basham, Kathy Sierra, Bert Bates Publisher: 'Reilly Media 6. Core Servlets and JSP Pages: Author Marty Hall , Larry Brown, Sun Microsystems 7. Java Servlet & JSP Cookbook by Bruce W. Perry O'Reilly Publication 8. Beginning JSP™, JSF™ and Tomcat™ Web Development: From Novice to Professional by Giulio Zamboni and Michael Sekler 9. JAVA Complete Reference , TMH Publication 10. Professional Java Development with Spring Framework , Wrox Publication
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 304: Full Stack Technology

Course Code	304
Course Title	Full Stack Technology
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make the students capable of developing full stack web applications.
Course Objective	The objective of the course is to make student understand full stack development
Pre-requisite	HTML, CSS, Front-end Scripting
Course Outcome	After completion of this course, the students will be able to design and develop Full Stack web applications
Course Content	Unit 1: Introduction 1.1 JavaScript 1.1.1 Execution Context and Call Stack 1.1.2 Hoisting in JavaScript 1.1.3 Spread Operator 1.1.4 Scope Chain, Temporal Dead Zone 1.1.5 Block Scope, Shadowing 1.1.6 Closures 1.2 Full Stack Technology Unit 2: React.js 2.1 React Introduction 2.1.1 What is React 2.1.2 What is a Component 2.1.3 JSX Overview 2.2 create-react-app 2.2.1 Understanding basics of react app 2.3 Understanding virtual DOM, SPA 2.4 Components 2.4.1 Class Components 2.4.2 Functional Components 2.4.3 Parent, Child Components 2.4.4 Conditional Rendering 2.4.5 State, setState Method 2.4.6 Props 2.5 Event Handling in React 2.5.1 Event Handling in Class Components 2.5.2 Event Handling in Functional Components 2.6 Lifecycle 2.6.1 Class Component Life Cycle Methods 2.7 React Hooks 2.7.1 What is a React Hook 2.7.2 useState Hook 2.7.3 useEffect Hook 2.8 Building forms in React 2.9 React Router 2.10 Controlled vs Uncontrolled Components 2.11 State Management 2.11.1 Single Source of Truth 2.11.2 Lifting State Up 2.11.3 Prop Drilling 2.11.4 useContext 2.11.5 Redux

	2.12 HTTP Methods 2.12.1 Fetch 2.12.2 Axios Unit 3: Node.js & Express.js 3.1 Introduction to Node.js 3.2 Creating a Simple Server 3.3 Response types - HTML, JSON 3.4 Modules 3.5 NPM 3.6 Introduction to Express.js 3.7 Express Params and Query String 3.8 Express Router Unit 4: Mongo DB 4.1 SQL/NoSQL landscape 4.2 Document Vs. Other types of Storage 4.3 MongoDB feature set 4.4 Introduction to BSON and JSON 4.5 Simple Queries 4.6 Connecting with Node JS 4.6.1 Inserts and Retrievals 4.6.2 Updates and Deletes Unit 5: MERN & Deployment 5.1 Connecting React and Node 5.2 Building an application in MERN 5.3 Github and CI/CD 5.4 Deploy using Netlify / Heroku
Reference Books	1. Eloquent JavaScript: A Modern Introduction to Programming, No Starch Press 2. You Don't Know JS, Shroff/O'Reilly 3. The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React.js, Zaccheus Entertainment 4. React Explained: Your Step-by-Step Guide to React, OS Training, LLC 5. Beginning React, Greg Lim 6. Learning React: Functional Web Development with React and Redux, Shroff/O'Reilly 7. Learn React Hooks: Build and refactor modern React.js applications using Hooks, Packt Publishing Limited 8. Pro React, Apress 9. Web Development with Node and Express: Leveraging the JavaScript Stack, O'Reilly Media 10. Express in Action: Writing, building, and testing Node.js applications, Manning Publications 11. Beginning Node.js, Express & MongoDB Development, Greg Lim 12. MongoDB: The Definitive Guide - Powerful and Scalable Data Storage, Shroff/O'Reilly; Third edition 13. Full-Stack React Projects: Learn MERN stack development by building modern web apps using MongoDB, Express, React, and Node.js, Packt Publishing Limited 14. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: Open Source Web Based Programming

Course Code	305
Course Title	Open Source Web Based Programming
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand fundamentals of Open Source web based Programming. The course also imparts students learning about Open source web based scripting language PHP and Mysql database. It also includes MVC or Three tier architecture of web based programming.
Course Objective	Student will learn fundamentals and advance topics of Open source Web technology
Pre-requisite	Knowledge of HTML and SQL
Course Out come	After studying the course, students will be able to understand how Open source web technology works. They will also be able to create database driven Websites.
Course Content	Unit 1 : Introduction to Open source Web based Programming 1.1 Introduction to PHP & MySql 1.2 Installation of PHP and MySql 1.3 Language Characteristics & Features 1.4 Operators and Variables, Control Structures, Looping and Error handling 1.5 PHP functions 1.5.1 String Functions 1.5.2 Array Functions 1.5.3 Mathematical Functions 1.5.4 Graphics Library (GD Support) 1.5.6 Date and Time Functions 1.5.7 Misc. Function 1.6 State management Techniques 1.7 Object Oriented Features of PHP 1.7.1 Classes and Objects 1.7.2 Use of constructors 1.7.3 Serialization 1.7.4 Inheritance Unit 2 : MySQL database server 2.1 Configuring the MySQL Server 2.2 MySQL Tables, Displaying MySQL Database ,Adding and removing user access 2.3 Database connection and data processing functions Unit 3 : Advance PHP 3.1 Ajax Basics 3.1.1 HTTP Request and Response Fundamentals 3.1.2 The XMLHttpRequest Object XMLHttpRequest Methods 3.1.3 XMLHttpRequest Properties 3.1.4 Cross-Browser Usage Sending a Request to the Server 3.1.5 PHP and Ajax Client-Driven Communication 3.1.6 Server-Side Processing Expanding and Contracting Content 3.1.7 Form Validation 3.1.8 Ajax-Based Database Querying 3.2 XML 3.3 Web services

	Unit 4 : MVC 4.1 Introduction to MVC 4.2 Introduction to Laravel, Architecture Concepts 4.3 Routing 4.4 Middleware 4.5 Controllers 4.6 Request & Response 4.7 View 4.8 URL generation 4.9 Validation 4.10 Session & Cookie 4.11 Form & File uploading 4.12 Error Handling 4.13 Security 4.14 Database Unit 5 : Advance Concepts of MVC 5.1 Blade Templates 5.2 Mail 5.3 Authentication 5.4 Authorization 5.5 Encryption
Reference Books	1. Beginning PHP, Apache, MySQL Web Development - Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass, Gary Mailer – Wrox Publication 2. Professional PHP Programming - Jesus Castagnetto ,Wrox Press Ltd 3. Beginning PHP and MySQL: From Novice to Professional - W. Jason Gilmore, Apress 4. Php: The Complete Reference - Steven Holzner, Tata Mcgraw Hill Education Private Limited 5. AJAX and PHP: Building Responsive Web Applications - Bogdan Brinzarea, CristianDarie packtpub 6. Php manual – www. Php.com 7. Beginning Laravel Build Websites with Laravel 5.8 - Sanjib Sinha · 2019 - Apress 8. Laravel The Ultimate Beginner's Guide to Learn Laravel Step by Step, 2nd Edition - Mem Lnc, Rufus Stewart
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: Programming Skills VIII

Course Code	306
Course Title	Programming Skills VIII
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: Programming Skills IX

Course Code	307
Course Title	Programming Skills IX
Credit	3
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the advanced concepts of .NET/Java practically.
Course Objective	Learning to implement the advanced topics of .NET/Java practically.
Pre-requisite	Practical programming in basic .NET/Java.
Course Outcome	After studying the course, students will be able to practically work on advanced technology platforms of .NET/Java.
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: Programming Skills X

Course Code	308
Course Title	Programming Skills X
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students in developing full stack web applications.
Course Objective	Practically learn full stack development
Pre-requisite	HTML, CSS, Front-end Scripting
Course Outcome	After completion of this course, the students will be able to design and develop Full Stack web applications
Course Content	Practical based on paper no 304. (Full Stack Technology) Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: Programming Skills XI

Course Code	309
Course Title	Programming Skills XI
Credit	3
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the basic and advanced concepts of PHP/MySQL practically.
Course Objective	Learning to develop and deploy websites using PHP/MySQL practically.
Pre-requisite	Basic scripting, programming, html.
Course Outcome	After studying the course, students will be able to practically develop dynamic websites using PHP/MySQL.
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

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Course: 301: Internet of Things (IoT)
(Elective)

Course Code	301
Course Title	Internet of Things (IoT)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 5. To make student understand IoT 6. To understand the working of Micro-Controller & Micro-Computer 7. To explain various types of sensors 8. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	Unit 1: Introduction to IoT 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet Unit 2: Networking and Communication 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS Unit 3: Sensors 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network Unit 4: Micro-Controller: Arduino, NodeMCU 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture

	4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU 4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout Unit 5: IoT App Interaction & Introduction to Raspberry Pi 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madiseti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: Machine Learning
(Elective)

Course Code	301
Course Title	Machine Learning (ML)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Unit 1 : Introduction 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance Unit 2 : Data Wrangling 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization Unit 3 : Supervised Learning 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour

	3.3.2 Support Vector Machines 3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine Unit 4 : Neural Network 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network Unit 5 : Unsupervised Learning 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: Design Patterns

Course Code	302
Course Title	Design Patterns
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 3. To study various Design Patterns 4. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	Unit -1 Creational Patterns 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern Unit-2 Structural Patterns 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern Unit-3 Behavioural Pattern 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern Unit-4 Additional Design Patterns 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern Unit-5 Pattern Applicability 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore

	5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud Self-Study : Pattern Languages
Reference Books	7. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addison Wesley 8. Head First Design Patterns, Eric Freeman, O'Reilly 9. Design Patterns in C#, Vaskaran Sarcar, Apress 10. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 11. Modern C++ design: generic Programming and design patterns applied, Alexandrescu, Andrei, Addison-Wesley 12. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: ERP Using SAP

Course Code	303
Course Title	ERP Using SAP
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	This course imparts fundamental as well as detailed Enterprise Resource Planning using SAP technology platform.
Course Objective	Learn ERP applications and its programming
Pre-requisite	Fundamentals of ERP, DBMS
Course Outcome	After studying this students will be able to understand how to work with ERP modules. After successful completion, students will be able to develop ERP application using SAP.
Course Content	Unit 1: Introduction 1.1 Introduction to ERP 1.2 Introduction to SAP 1.3 Example: How SAP works in an Organization Unit 2: Architecture of SAP Application Server 2.1 3-Tier Architecture 2.2 Application Servers 2.3 Work processes and its Type Unit 3: Data Dictionary & Data Structures in ABAP 3.1 Introduction to Data dictionary 3.2 Different Types of Data structures 3.3 Internal Tables and its operation Unit 4: Modularization Techniques 4.1 Include Programs 4.2 Subroutines 4.3 Function Module. 4.4 Types of Function Module(Simple, RFC enabled, BAPI) Unit 5: List Report, ALV Report 5.1 Simple List Report 5.2 Interactive List Report 5.3 Events in List Reports 5.4 Field catalog generation in ALV 5.5 Operation on ALV(Sorting, Filtering, Totals, Subtotals, Download, Hide Columns) Unit 6: Module pool programming / Screen Programming 6.1 Screen Elements(Simple & Complex) 6.2 Screen Events(PBO/PAI) 6.3 Transactions Unit 7: Selection-Screen programming 7.1 Defining Selection Screen. 7.2 User Actions on Selection Screen. 7.3 Events of Selection Screen

	Unit 8: Smartform/Sapscript 8.1 Form printing with smartform 8.2 Form printing with Sapscript Unit 9: BDC & LSMW 9.1 Data upload through BDC 9.2 Data upload through LSMW Unit 10: Enhancement(Exits & BADI) 10.1 What is Enhancement 10.2 User-Exits 10.3 BADI(Business Add-in)
Reference Books	1. ABAP Cookbook by James Wood 2. BC - ABAP Programming from SAP-AG 3. Teach Yourself ABAP/4 in 21 Days by Ken Greenwood, SAMS 4. SAP Smart Forms by Christoph Wachter, Werner Hertleif 5. SAPscript by Michaelson Buchanan 6. Developing Sap's R/3 Application with Abap/4 7. Data Migration Made Easy - R/3 Simplications Group, SAP Labs 8. ABAP Development for SAP NetWeaver BW: Exits, BAdIs, and Enhancements by Dirk Herzog 9. Next Generation ABAP Development (2nd Edition) by Rich Heilman and Thomas Jung
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 303: NoSQL Databases

Course Code	303
Course Title	NoSQL Databases
Credit	4
Teaching per Week	4
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To teach the emerging trends in NoSQL databases
Course Objective	To impart knowledge of NoSQL Databases
Pre-requisite	Fundamentals of DBMS
Course Outcome	Students will be able to learn NoSQL databases – namely MongoDB and Cassandra
Course Content	Unit 1: Introduction 1.1 History 1.2 Concepts and Characteristics of NoSQL databases 1.3 Primary benefits of NoSQL databases Unit 2: MongoDB 2.1 SQL/NoSQL landscape 2.2 Document Vs. Other types of Storage 2.3 MongoDB feature set 2.4 Introduction to BSON and JSON 2.5 MongoDB Architecture 2.6 Documents and Collections 2.6.1 Creating Documents 2.6.2 Managing Documents in collections 2.6.3 Iterating over Documents 2.7 Queries 2.7.1 Simple Queries 2.7.2 Complex Queries 2.7.2.1 Existential field values 2.7.2.2 Aggregations and groups 2.7.2.3 Aggregations and groups in hierarchical data 2.8 Updates and Deletes 2.9 Updates and Arrays 2.10 Indexing 2.11 MongoDB RESTful API 2.12 MongoDB Security 2.13 MongoDB Replication and Sharing 2.14 Introduction to MapReduce Unit 3: Cassandra 3.1 Cassandra Architecture 3.1.1 Cassandra P2P Architecture 3.1.2 Clustering Structures- Nodes 3.1.3 Rings 3.1.4 Virtual Nodes 3.1.5 Consistency & Hashing 3.1.6 Gossip Protocol 3.1.7 Data Replication 3.1.8 Replication Factors & Indexes 3.1.9 Tunable Consistency 3.1.10 High & Rapid Scalability Memtables, SSTables & Commitlogs

	3.1.11 Repairs 3.1.12 Tombstones 3.1.13 Repairs 3.1.14 Replication Factors 3.1.15 Compaction and Anti-Entropy 3.1.16 Bloom Filters 3.2 Data Modelling in Cassandra 3.3 Cassandra Administration 3.4 CQL3 3.5 Integration with Hadoop
Reference Books	1. Chodorow, K. (2013). MongoDB: The Definitive Guide (2nd ed.). Upper Saddle River, NJ: Pearson Education, Inc. ISBN-13: 978-1449344689 ISBN-10: 1449344682. 2. Shashank Tiwari, Professional NoSQL, Sierra Nevada Books, ISBN-13: 978-0470942246 3. Amol Nayak, Instant MongoDB, Packt Publishing Limited, 2013, ISBN-13: 978-1782169703 4. Kristina Chodorow, MongoDB Definitive Guide 2e, O'Reilly, 2013, ISBN-13: 978-1449344689 5. Eben Hewitt, Cassandra Definitive Guide, O'Reilly, 2010, ISBN:ISBN 10:1-4493-9041-2
Teaching Methodology	Classroom, seminar and assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 304: Advanced Database Administration

Course Code	304
Course Title	Advanced Database Administration
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding advanced database administration
Course Objective	To learn advanced database administration, database tuning and maintenance
Pre-requisite	RDBMS
Course Out come	After studying the course, students will be able to perform Database Administration
Course Content	Unit 1. Oracle10g Instance creation and management 1.1 Oracle Instance 1.2 Installing Oracle 1.3 Oracle Optimal Flexible Architecture (OFA) 1.4 Locating initialization, listener.ora & sqlnet.ora files 1.5 Finding the alert log 1.6 Common environment variables 1.7 Structures in an Oracle Instance 1.8 Oracle Memory Structures, SGA and PGA 1.9 Oracle Processes and their purposes 1.10 Startup, nomount, mount and open database commands Unit 2. Oracle10g Database Architecture 2.1 Oracle10g management framework 2.1 Using the Database Creation Assistant (DBA) 2.3 Creating and dropping a database 2.4 Tablespaces 2.5 Tables and Indexes 2.6 Clusters 2.7 Partitioning of Tables and Indexes 2.8 Gathering and applying patches Unit 3. Concurrency Management 3.1 Transactions, serialization, locks and latches 3.2 Lock modes 3.3 Detecting and resolving lock conflicts 3.4 Managing deadlocks Unit 4. Interfacing with Oracle 4.1 Oracle transaction management 4.2 Using SQL*Plus and iSQL*Plus 4.3 Using embedded Oracle with Pro*C & Java 4.4 PL/SQL & Triggers 4.5 Pining PL/SQL packages & compiling PL/SQL 4.6 System-level triggers – startup trigger, logon trigger, PL/SQL error trigger Unit 5. Oracle*Net 5.1 Basic Network structure 5.2 Oracle*Net Files 5.3 Multi-threaded server 5.4 Create additional listeners 5.5 Create Oracle Net service aliases

- 5.6 Configure connect time failover
- 5.7 Oracle*Net names resolution

Unit 6. Tablespace Management Overview

- 6.1 Dictionary Managed Tablespaces
- 6.2 Locally Managed Tablespaces
- 6.3 Automatic Segment Space Management
- 6.4 Moving tablespaces online and offline

Unit 7. UNDO Tablespace Management

- 7.1 Use of undo segments
- 7.2 Creating an undo tablespace
- 7.3 User managed undo tablespaces
- 7.4 Automatic undo management
- 7.5 Monitor & Configure undo retention
- 7.6 Use the Undo Advisor
- 7.7 Size the undo tablespace

Unit 8. Oracle Utilities

- 8.1 Datapump - Import/export
- 8.2 SQL*Loader
- 8.3 Oracle Streams
- 8.4 Automatic Database Diagnostic Monitor
- 8.5 Automatic Tuning Optimizer
- 8.6 Automatic Shared Memory Tuning

Unit 9. Oracle Performance Tuning

- 9.1 Locate invalid and unusable objects
- 9.2 Gather SQL optimizer statistics with dbms_stats
- 9.3 Basic Oracle performance metrics
- 9.4 Use OEM and dbms_alert to set warning and critical alert thresholds
- 9.5 The SQL Tuning Advisor
- 9.6 The SQL Access Advisor
- 9.6 Interpreting server generated alerts
- 9.7 Oracle advisory utilities v\$sql_cache_advice, v\$sqlshared pool_advice, v\$sqlpga_aggregate_target_advice
- 9.8 Using OEM performance screens
- 9.9 Fixing performance issues

Unit 10. User Management

- 10.1 Creating Users
- 10.2 Altering users
- 10.3 User Profiles
- 10.4 User resource groups
- 10.5 Granting privileges & roles
- 10.6 Auditing user activity with dbms_audit

Unit 11. Oracle Security

- 11.1 Password use in Oracle, Password encryption and password aging, External authentication, Using Single sign-on (SSO)
- 11.2 Object security
- 11.3 Virtual Private Databases (VPD) in Oracle
- 11.4 Oracle "grant execute" security
- 11.5 Use of Roles in Oracle
- 11.6 Register for security updates

Unit 12. Backup & Recovery

	12.1 Oracle backup & recovery planning 12.2 Parallel instance recovery 12.3 Basics of checkpoints, redo log files, and archived log files 12.4 Using ARCHIVELOG mode 12.5 Creating consistent Oracle backups 12.6 Online hot backups 12.7 Incremental Oracle backups 12.8 Automating database backups with dbms_scheduler 12.9 Monitor the flash recovery area 12.10 Recovering from loss of a Control file 12.11 Recovering from loss of a Redo log file 12.12 Recovering from loss of a system-critical data file 12.13 Recovering from loss of a non system-critical data file
Reference Books	1. Essentials : Oracle Database 10g by Rick Greenwald, Robert Stackowiak, Jonathan Stern, O'Reilly 2. Oracle High Performance Tuning for 9i and 10g by Gavin Powell, Digital Press 3. Oracle Database 10g, DBA Handbook by Loney, Kevin, Bryla, Bob, Oracle Press 4. Oracle Database 10g - The Complete Reference by Loney, Kevin, Oracle Press 5. Oracle Database 10g: A Beginner's Guide by Micheal Abbey, Ian Abramson Osborne, Oracle Press Series
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: Data Warehousing & Data Mining

Course Code	305
Course Title	Data Warehousing & Data Mining
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding Data Warehousing and Data Mining
Course Objective	To understand data warehousing and data mining - concepts and methods, and apply them in practice
Pre-requisite	RDBMS, Basics of statistics
Course Outcome	After studying the course, students will learn data warehousing and data mining and its effective use in various applications
Course Content	Unit 1: Data warehouse: Introduction 1.1 Data Warehouse characteristics 1.2 Data Marts 1.3 OLTP and OLAP systems 1.4 Star, Snowflakes, and Fact Constellations Schemas for Multi-dimensional Databases 1.5 OLAP Operations in the Multidimensional data model 1.6 Type of OLAP servers Unit 2: Developing Data Warehouse 2.1 Building a Data Warehouse 2.2 Three-Tier Data Warehouse Architecture 2.3 Metadata Repository Unit 3: Data Pre-processing 3.1 Descriptive Data Summarization: central tendency, disperation of data 3.2 Data Cleaning : missing values, noisy data 3.3 Data Integration & Transformation 3.4 Data Reduction: Attribute selection 3.5 Data Discretization & Concept Hierarchy Generation Unit 4: Data Mining: Introduction 4.1 Knowledge discovery and Data Mining. 4.2 Basic Introduction to Data Mining Functionalities: 4.2.1 Concept/Class Description Characterization & Discrimination 4.2.2 Mining Frequent Patterns, Associations, and Correlations 4.2.3 Classification & Prediction 4.3.4 Cluster Analysis 4.2.5 Outlier Analysis 4.2.6 Evolution analysis Unit 5: Mining Frequent Patterns, Associations, and Correlations 5.1 Basic concepts: Frequent Itemsets & Closed Itemsets, Association Rules 5.2 The Apriory algorithm: Finding Frequent Itemsets Using Candidate Generation 5.3 FP-growth: Finding Frequent Itemsets without Candidate Generation 5.4 Generating Association Rules from Frequent Itemsets 5.5 Introduction to multilevel and multidimensional Association rules Unit 6: Classification & Prediction

	6.1 Introduction to Classification & Prediction? 6.2 Prediction: Linear Regression, Nonlinear Regression 6.3 Decision Tree Algorithm 6.3.1 Decision Tree Induction 6.3.2 Attribute Selection Measures- Information Gain and Gain Ratio 6.3.3 Tree Pruning 6.4 Bayesian Classification 6.4.1 Bayes' Theorem 6.4.2 Naïve Bayesian Classification 6.5 Accuracy and Error Measures for classification Unit 7: Cluster Analysis 7.1 Classification vs. clustering 7.2 What is Partitioning & Hierarchical Clustering Methods 7.3 Classical Partitioning Methods: k-Means Unit 8: Application and Trends in Data Mining
Reference Books	1. Data Mining: Concepts & Techniques by Han & Kamber , Morgan Kaufmann Publishers 2. Introduction to Data Mining with Case Studies by G. K. Gupta, PHI 3. Data Mining Introductory and Advanced Topics by Dunha, Pearson 4. Data Warehouse Toolkit by R. Kinball, John Wiley & Sons 5. Data Warehouses and OLAP: Concepts, Architectures, and Solutions by Robert Wrembel, Christian Koncilia I, GI 6. Data Mining Techniques: For Marketing, Sales, and Customer Relationship Management by Gordon S. Linoff, Michael J. A. Berry, Wiley 7. Data Preparation for Data Mining by Dorian Pyle, Morgan Kaufmann Publishers 8. Data Warehousing Fundamentals: A Comprehensive Guide for IT Professionals by Paulraj Ponniah, Wiley 9. Data Warehousing: Concepts, Techniques, Products and Applications by C.S.R. Prabhu, PHI Learning 10. Advanced Data Mining Techniques by David Louis Olson, Dursun Delen, Springer
Teaching Methodology	Class work, Discussion, Self-study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: **Big Data**

Course Code	305
Course Title	Big Data
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding distributed computing, Big Data and Hadoop
Course Objective	To learn Big Data and Hadoop
Pre-requisite	RDBMS
Course Out come	After studying the course, students will have understanding distributed computing and will have hands-on experience on Hadoop
Course Content	Unit 1: Introduction 1.1 Evolution of Big Data 1.2 Structuring Big Data 1.3 Elements of Big Data(V's) 1.4 Big Data Analytics 1.5 Commercial use of Big Data Unit 2: Big Data Technology 2.1 Distributed and Parallel Computing 2.2 Introducing Hadoop 2.3 HDFS and MapReduce 2.4 Cloud Computing and Big Data 2.5 In-Memory Computing Unit 3: Hadoop 3.1 HDFS Architecture 3.2 Blocks 3.3 Name Nodes and Data Nodes 3.4 Using HDFS Files 3.5 Hadoop Specific File System Types 3.6 HDFS Commands 3.7 org.apache.hadoop.io package 3.8 MapReduce Architecture 3.9 Hadoop YARN 3.10 HBase 3.11 Combining HBase 3.12 Hive 3.13 Pig and Pig Latin 3.14 Sqoop Unit 4: Technology Foundations 4.1 Big Data Stack 4.2 Virtualization and Big Data Unit 5: Storing Data in Databases and Processing of Data 5.1 RDBMS and Big Data 5.1.1 CAP Theorem 5.3 NoSQL Databases 5.4 Polygot Persistence 5.5 Integrating Big Data with traditional Data Warehouses 5.6 Big Data Analytics

	5.7 Processing Data with MapReduce 5.8 Customizing MapReduce Execution and implementing MapReduce Program 5.9 Testing and Debugging MapReduce Applications 5.10 Analytical Approaches and Tools to Analyze Data
Reference Books	1. D T Editorial services, Big Data Black book, Dreamtech Press, ISBN 978-93-5119-931 2. Alex Holmes, Hadoop in Practice, Manning Publication company, 2014, ISBN 1617292222, 9781617292224 3. Kuan-Ching, Li Hai Jiang, Laurence T. Yang Alfredo Cuzzocrea, Big Data : Algorithms, Analytics and Applications. CRC Press 4. Hu, Wen Chen, Big Data Management, Technologies and Applications, IGI Global 5. Tom White, Hadoop The Definitive Guide, o'Reilly
Teaching Methodology	Class work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: Programming Skills VIII

Course Code	306
Course Title	Programming Skills VIII
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: Programming Skills IX

Course Code	307
Course Title	Programming Skills IX
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the concepts of SAP/NoSQL practically
Course Objective	Learning to implement the ERP using SAP/NoSQL databases practically
Pre-requisite	DBMS
Course Outcome	After studying the course, students will be able to practically work on SAP/NoSQL Databases
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: Programming Skills X

Course Code	308
Course Title	Programming Skills X
Credit	2
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to handle advanced database administration activities
Course Objective	Advanced database administration
Pre-requisite	Practically learning advanced database administration
Course Outcome	After studying the course, students will be able to handle database administration, tuning and maintenance in various fields
Course Content	Practical based on paper no 304. Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: **Programming Skills XI**

Course Code	309
Course Title	Programming Skills XI
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement Data warehousing & data mining / Big Data practically.
Course Objective	Learn to use Data warehousing and data mining techniques in various practical environments / use Big data practically.
Pre-requisite	Databases, SQL, Advanced SQL
Course Outcome	After studying the course, students will be able to understand Data warehousing and data mining/Big Data practically
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

**MCA 3rd
Sem.
(Network
Group)**

Course: 301: Internet of Things (IoT)
(Elective)

Course Code	301
Course Title	Internet of Things (IoT)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 9. To make student understand IoT 10. To understand the working of Micro-Controller & Micro-Computer 11. To explain various types of sensors 12. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	Unit 1: Introduction to IoT 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet Unit 2: Networking and Communication 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS Unit 3: Sensors 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network Unit 4: Micro-Controller: Arduino, NodeMCU 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture

	4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU 4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout Unit 5: IoT App Interaction & Introduction to Raspberry Pi 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madisetti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: Machine Learning
(Elective)

Course Code	301
Course Title	Machine Learning (ML)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Unit 1 : Introduction 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance Unit 2 : Data Wrangling 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization Unit 3 : Supervised Learning 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour

	3.3.2 Support Vector Machines 3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine Unit 4 : Neural Network 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network Unit 5 : Unsupervised Learning 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: Design Patterns

Course Code	302
Course Title	Design Patterns
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 5. To study various Design Patterns 6. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	Unit -1 Creational Patterns 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern Unit-2 Structural Patterns 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern Unit-3 Behavioural Pattern 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern Unit-4 Additional Design Patterns 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern Unit-5 Pattern Applicability 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore

	5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud Self-Study : Pattern Languages
Reference Books	13. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addison Wesley 14. Head First Design Patterns, Eric Freeman, O'Reilly 15. Design Patterns in C#, Vaskaran Sarcar, Apress 16. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 17. Modern C++ design: generic Programming and design patterns applied, Alexandrescu, Andrei, Addison-Wesley 18. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: Network Essentials and its Security

Course Code	303
Course Title	Network Essentials and its Security
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	To make students learn Network essentials and various security measures for the challenges to which the IT industry is exposed
Course Objective	To understand Network Management and its security
Pre-requisite	Computer Network, TCP/IP
Course Outcome	Students will be able to solve and determine best solutions for the challenging area of Network Security
Course Content	Unit 1: Network Essentials 1.1 Repeaters & Bridges 1.1.1 LAN Expansion 1.1.2 Repeaters 1.1.3 Bridges 1.1.4 How Bridges Work 1.1.5 Creating the routing table 1.1.6 Segmenting Network Traffic 1.1.7 Remote Bridges 1.1.8 Differentiating between bridges and repeaters 1.2 Routers & Gateways 1.2.1 Routers 1.2.2 How routers work 1.2.3 Routing benefits 1.2.4 Routing protocols 1.2.5 Routing V/S Bridging 1.2.6 B Routers 1.2.7 Gateways 1.2.8 How Gateways work 1.3 Network Administration 1.3.1 Bottlenecks 1.3.2 Simple Network Management Protocol 1.3.3 Data Protection 1.3.4 Backup Methods 1.3.5 Testing and Storage 1.3.6 Implementing a Backup System 1.3.7 Uninterruptible Power Suppliers 1.3.8 How Gateways work 1.3.9 Implementing Fault Tolerant Systems 1.3.10 RAID 1.3.11 Sector Sparing 1.4 Advance WAN Transmission 1.4.1 Overview 1.4.2 Multiplexing, Packet and Circuit Switching Networks 1.4.3 X.25 1.4.4 Asynchronous Transfer Mode (ATM) 1.4.5 ISDN 1.4.6 SONET 1.4.7 SMDS Unit 2: Introduction to Network Security Unit 3: Cryptography Techniques 3.1 Classical Cryptography

	3.2 Conventional Cryptography 3.2.1 DES 3.3 Public – key Cryptography 3.3.1 RSA 3.4 Digital Signatures 3.4.1 DSA Unit 4: Security Services 12.1 Message Integrity 12.2 Confidentiality and Authentication 12.3 Certification and Key Management 4.3.1 PKI Unit 5: Network Security Applications 5.1 IP Security 5.1.1 IPsec 5.2 Web Security 5.2.1 SSL, TLS, SET 5.3 Electronic Mail Security 5.3.1 PGP, S/MIME 5.4 SNMP Security Unit 6: Access Control in Computer Networks 6.1 Authentication Protocols and Services 6.1.1 Kerberos and X.309 6.2 Firewalls 6.3 Virtual Private Networks (VPNs) Unit 7: System Security 7.1 Intrusion detection 7.2 Viruses Unit 8: Mobile System & E-Commerce Securities 8.1 3G Security 8.2 E-Payment Systems 8.3 Fair Data Exchange
Reference Books	1) Cryptography and Network Security, 2/e, ISBN: 0-13-869017-0 - W. Stallings - Pearson Education, 1999 2) Network Security Essentials: Applications and Standards, 1/e, ISBN: 0-13-016093-8 - W. Stallings - Pearson Education, 2000 3) SSL and TLS: designing and building secure systems, ISBN: 0-201-61598-3 - E. Rescorla - Addison-Wesley, 2001 4) Implementing Secure Intranets and Extranets, ISBN: 0-89006-447-4 - K M Phaltankar - Artech House Publishers, 2000 5) Secure Electronic Commerce: Building the Infrastructure for Digital Signature and Encryption, ISBN: 0-13-027276-0 - W. Ford, and M. Baum - Prentice Hall, 2001 6) Security in Computing, ISBN: 0-13-185794-0, 2/e - C. P. Pfleeger - Prentice Hall, 1997 7) Building Internet Firewalls, 2/e, ISBN: 1-56592-871-7 - E. D. Zwicky, et al - O'Reilly, 2000 8) CDMA Cellular Mobile Communications & Network Security, ISBN: 0-13-598418-1 - M. Y. Rhee, - Prentice Hall, 1998 9) Journal of Computer Security 10) ACM Transactions on Information and System Security 11) ACM Conference on Computer and Communications Security 12) IEEE Symposium on Security and Privacy

	13) Internet documents - RFCs (Request for Comments) 14) Guide to Networking Essentials, Fourth Edition - Greg Tomsho, et al 15) Computer Networking Essentials - Debra Littlejohn Shinder 16) Networking Essentials: Hands-On, Self-Paced Training for Supporting Local and Wide Area Networks - Microsoft Corporation (Corporate Author) 17) Computer Network - A. S. Tanenbaum
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 304: Network Administration

Course Code	304
Course Title	Network Administration
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding advanced network administration
Course Objective	To learn advanced network administration, its configuration and maintenance
Pre-requisite	Computer Network, TCP/IP
Course Outcome	After studying the course, students will be able to perform Network Administration
Course Content	Unit 1: Networking and TCP/IP on Linux a. Fundamentals of Linux Networking b. Fundamentals of TCP/IP on the Linux Operating System c. Advanced Linux TCP/IP Concepts d. Introduction to Dial-up Technologies Unit 2: Dynamic Host Configuration Protocol 2.1 Introduction to BOOTP and DHCP 2.2 Installing and Examining a Linux DHCP server 2.3 Examining Additional DHCP Options and Configurations Unit 3: Domain Name System 3.1 Introduction to the Domain Name System 3.2 Installing and Configuring DNS Unit 4: The Network File System 4.1 Introduction to the Network File System 4.2 Configuring NFS Unit 5: Linux Remote Administration 5.1 Introduction to Remote Administration 5.2 The Telnet Protocol 5.3 The open secure Shell protocol Unit 6: The Cron Daemon 6.1 Introduction to Automation 6.2 Configuring the Cron Daemon Unit 7: Samba 7.1 Introduction to Samba 7.2 Cross-Platform Connectivity 7.3 Installing and Configuring Samba Unit 8: Linux System-Wide Logging 8.1 Introduction to System-wide Logging 8.2 Configuring System-Logging Unit 9: The Network Information Service 9.1 Introduction to NIS 9.2 Setting Up and Configuring an NIS server
Reference Books	1) TCP/IP Network Administration - Craig Hunt - O'Reilly & Associates 2) Managing NFS and NIS - Hal Stern - O'Reilly & Associates

	3) DNS and BIND - Albitz/Liu - O'Reilly & Associates 4) Sendmail - Bryan Costales/Eric , Allman/Neil Rickert - O'Reilly & Associates 5) UNIX System Administration Handbook - Second Edition - Nemeth/Snyder/Seebass - Prentice Hall 6) Red Hat Linux Networking and System Administration – Terry Collings, Kurt Wall 7) Red Hat Linux 9 Bible - Christopher Negus 8) Official Red Hat Linux User's Guide - Red Hat Inc. 9) Official Red Hat Linux Administrator's Guide - Red Hat Inc. 10) Red Hat Linux Security and Optimization - Mohammad J. Kabir
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: **Wireless Network and Mobile Computing**

Course Code	305
Course Title	Wireless Network and Mobile Computing
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding Wireless Network and Mobile Computing
Course Objective	To understand various aspects related to Wireless Network technologies, mobile networks and its computing
Pre-requisite	Computer Network
Course Outcome	Students will be able to implement various Wireless Network protocols and learn Mobile Computing
Course Content	Unit 1: Introduction to Wireless Network Technologies 1.1 Introduction 1.2 Standards 1.3 Emerging Technologies 1.4 OSI Basics 1.5 LAN Basics 1.6 LAN & WAN Protocols 1.7 Internet Protocol Unit 2: Wireless LAN Technologies, Implementation and Layers 2.1 Frequency Hopping Spread Spectrum 2.2 Direct Sequence Spread Spectrum (DSSS) 2.3 Interference 2.4 RF Math 2.5 Service Sets 2.6 Mobile IP 2.7 Appropriate use and design of wireless Networking Multipath 2.8 Co-location 2.9 Power-over-Ethernet (PoE) 2.10 Modulation and Bit Coding 2.11 Fragmentation 2.12 SIFS / PIFS / DIFS / EIFS Unit 3: Hardware Configuration, Implementation and Protocols 3.1 Access Points 3.2 Bridges 3.3 Workgroup bridges 3.4 Wireless Residential Gateways 3.5 Host Connectivity 3.6 Antennas, Cables, & Connectors 3.7 MAC and Routing Protocols for IEEE 802.11 3.8 Wireless Mesh Networks Unit 4: MANET 4.1. Various applications of MANET 4.2. Destination- Sequenced Distance Vector protocol 4.3. Dynamic Source Routing protocol 4.4. Ad Hoc On-Demand Distance-Vector protocol 4.5. Link Reversal Routing a. Gafni-Bertsekas algorithm b. Lightweight mobile routing algorithm.

	4.6. Temporally ordered routing algorithm Unit 5: Introduction to Mobile Computing, GSM, GPRS & WAP 5.1 Mobility, Nomadic, Mobile and Ubiquitous computing 5.2 Mobile Computing Architecture 5.3 Mobile Computing Technologies (Hardware, Software, Communication) 5.4 Introduction to GSM 5.5 GSM Architecture, Mobility Management, Network Signaling 5.6 GPRS Architecture 5.7 Network Nodes 5.8 Mobile Internet Standards, WAP Gateway and Protocols 5.9 WML
Reference Books	1) Wireless Local Area Network Fundamentals - Pejman Roshan, Jonathan Leary 2) Wireless Networks First Step (First-step series) - Jim Geier 3) 802.11 wireless network site surveying and installation - Bruce Alexander 4) Introduction to Wireless and Mobile Systems by Cengage Learning (Thompson) 5) J. Schiller, Mobile Communications, Addison –Wesley, 2003 6) Wi-Fi Security - Stewart Miller 7) Wireless and Mobile Network - Architecture Yi-Bing Lin & Imrich Chlamtac - John Wiley & Sons, 2001 8) Mobile and Wireless Design Essentials by Martyn Mallick, John Wiley & Sons 9) Guide to Designing and Implementing wireless LANs - Mark Ciampa - Thomson learning , Vikas Publishing House, 2001 10) Wireless Web Development - Ray Rischapter - Springer publishing, 2000
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: Programming Skills VIII

Course Code	306
Course Title	Programming Skills VIII
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: **Programming Skills IX**

Course Code	307
Course Title	Programming Skills IX
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand the Networking and its security practically
Course Objective	Learning to implement Network and its security practically.
Pre-requisite	Network fundamentals
Course Outcome	After studying the course, students will be able to practically implement network and its security
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: **Programming Skills X**

Course Code	308
Course Title	Programming Skills X
Credit	2
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to learn network administration
Course Objective	Students will learn administration of network practically
Pre-requisite	Networking fundamentals
Course Outcome	After studying the course, students will be able to practically perform administrative tasks of networks practically
Course Content	Practical based on paper no 304. Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: **Programming Skills XI**

Course Code	309
Course Title	Programming Skills XI
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the basic and advanced concepts of wireless network and mobile computing
Course Objective	Learning wireless protocols and its implementation practically
Pre-requisite	Computer Network, C/C++ programming
Course Outcome	After studying the course, students will be able to practically develop/enhance wireless protocols and find better solutions application to the various industries dependent upon them
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

**MCA 3rd
Sem.
(General
Group)**

Course: 301: Internet of Things (IoT)
(Elective)

Course Code	301
Course Title	Internet of Things (IoT)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to IoT. The course also gives students an idea about various components of IoT and explain its working. The course also explains the role of embedded systems in IoT ecosystem.
Course Objective	The objective of the course is - 13. To make student understand IoT 14. To understand the working of Micro-Controller & Micro-Computer 15. To explain various types of sensors 16. To introduce students with Programming in IoT
Pre-requisite	C , C++
Course Outcome	After studying this course, student will be able to understand how Micro-Controller & Micro-Computer works. It will also help them to appreciate the role of embedded systems in IoT environment. After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development.
Course Content	Unit 1: Introduction to IoT 1.1 What is IoT 1.2 IoT Applications 1.3 IoT Privacy and Security 1.3.1 Identification in Distributed Environment 1.3.2 Device Authentication 1.4 IoT Botnet Unit 2: Networking and Communication 2.1 Basics of Wireless Networking 2.1.1 CSMA/CA 2.2 IoT Network Protocols 2.2.1 BLE, Zigbee, LoRaWAN, RFID 2.3 IoT Data Protocols 2.3.1 CoAP, MQTT, XMPP, DDS Unit 3: Sensors 3.1 Introduction to Sensors 3.2 Types of Sensors & their working 3.3 Wireless Sensor Network 3.3.1 Introduction to WSN 3.3.2 Applications 3.3.3 Characteristics 3.3.4 Challenges 3.3.5 Components 3.4 Wireless Adhoc Network Vs Wireless Sensor Network Unit 4: Micro-Controller: Arduino, NodeMCU 4.1 Introduction to Microcontrollers 4.2 Arduino IDE 4.3 Arduino Architecture

	4.4 Arduino Pin Diagram 4.5 Introduction to NodeMCU 4.6 NodeMCU Specifications and Applications 4.7 NodeMCU ESP8266 Pinout Unit 5: IoT App Interaction & Introduction to Raspberry Pi 5.1 Uploading sensor data to server 5.2 Reading sensor data from server 5.3 Controlling IoT device and components from Mobile or Web 5.4 Introduction to Microcomputers 5.5 Raspberry Pi Architecture 5.6 Raspberry Pi Pinout
Reference Books	1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madiseti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub 12) Internet of Things Projects with ESP32, Packt Publishing Limited 13) Microprocessor Architecture, Programming and Applications with the 8085 - By Ramesh Gaonkar , Penram International Publishing 14) Raspberry Pi for Dummies , Wiley 15) Raspberry Pi User Guide – By Eben Upton and Garath Halfacree, Wiley
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 301: Machine Learning
(Elective)

Course Code	301
Course Title	Machine Learning (ML)
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course is an introduction for students to ML. The course also gives students an idea about various methods and algorithms of Machine Learning and application development of ML.
Course Objective	The objective of the course is – 1. To make student understand ML 2. To understand the various Machine Learning method 3. To explain various algorithms used in Machine learning 4. To introduce students with Programming in ML
Pre-requisite	Basics of Linear Algebra, Statistics and Mathematics, Python Programming
Course Outcome	After studying this, student will be able to understand how ML works. This course will also help students to appreciate the role of ML in industry environment. After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Unit 1 : Introduction 1.1. Definition of Machine Learning 1.2 Types of Machine Learning : Supervised , Unsupervised and Semi-supervised 1.3 Applications and tools of Machine Learning (Scikit learn library) 1.4 Data Pre-processing, Selecting a model and training a model 1.5 Evaluating a performance of model and improving performance Unit 2 : Data Wrangling 2.1 Definition and goal of Data Wrangling 2.2 Importance of Data Wrangling 2.3 Data Pre-processing and Data Cleaning 2.3.1 Data Cleaning 2.3.2 Data Transformation 2.3.3 Data Reduction 2.3.4 Data Discretization 2.3.5 Feature Selection 2.4 Data Visualization Unit 3 : Supervised Learning 3.1 Supervised Learning : Classification and Regression 3.2 Regression 3.2.1 Simple and Multiple Regression 3.2.2 Linear Regression 3.2.3 Gradient Decent 3.2.4 Logistic Regression 3.3 Classification Algorithms : 3.3.1 K-nearest Neighbour

	3.3.2 Support Vector Machines 3.3.3 Decision Trees 3.3.4 Naïve Bayes Classifier 3.4 Introduction to Support Vector Machine Unit 4 : Neural Network 4.1 Introduction to Neural Network 4.2 Architecture of Neural Network 4.3 Feedforward network and Backpropagation with example 4.4 Applications of Neural Network Unit 5 : Unsupervised Learning 5.1 Introduction to Unsupervised learning 5.2 Clustering 5.2.1 Selection of Clusters 5.2.2 Algorithms : 5.2.2.1 K – means clustering 5.2.2.2 Hierarchical Clustering 5.3 Association Rule Learning 5.3.1 Algorithms : 5.3.1.1 FP- Growth 5.3.1.2 Apriori Algorithm
Reference Books	1. “Machine Learning” by Tom M. Mitchell, McGraw Hill 2. “Understanding Machine Learning” by Shai Shalev-Shwartz, Shai Ben-David 3. “Machine Learning” by Anuradha Srinivasaraghavan, Vincy Joseph 4. “Machine Learning using Python” by U Dinesh Kumar Manaranjan Pradhan 5. “Real-World Machine Learning” by Henrik Brink, Joseph Richards, Mark Fetherolf 6. “Python Machine Learning” by Sebastian Raschka and Vahid Mirjalili 7. “Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems” by Aurelien Geron 8. “Machine Learning in Action” by Peter Harrington 9. “Introduction to Machine Learning with Python : A Guide for Data Scientists” by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 302: Design Patterns

Course Code	302
Course Title	Design Patterns
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	The purpose of the course is to make student understand how Patterns can be implemented in various object oriented programming languages to solve real world problems.
Course Objective	The objective of the course is - 7. To study various Design Patterns 8. How these Patterns can be used to design better systems through Object Oriented Programming Languages
Pre-requisite	Object Oriented Programming, Software Engineering
Course Outcome	After completion of this course, the student will be capable of implementing various Design Patterns in different Object Oriented Programming languages.
Course Content	Unit -1 Creational Patterns 1.1 Singleton Pattern 1.2 Prototype Pattern 1.3 Builder Pattern 1.4 Factory Method Pattern 1.5 Abstract Factory Pattern Unit-2 Structural Patterns 2.1 Proxy Pattern 2.2 Decorator Pattern 2.3 Adapter Pattern 2.4 Façade Pattern 2.5 Flyweight Pattern 2.6 Composite Pattern 2.7 Bridge Pattern Unit-3 Behavioural Pattern 3.1 Visitor Pattern 3.2 Observer Pattern 3.3 Strategy Pattern 3.4 Template Method Pattern 3.5 Command Pattern 3.6 Iterator Pattern 3.7 Memento Pattern 3.8 State Pattern 3.9 Mediator Pattern 3.10 Interpreter Pattern Unit-4 Additional Design Patterns 4.1 Simple Factory Pattern 4.2 Null Object Pattern 4.3 MVC Pattern Unit-5 Pattern Applicability 5.1 Security Patterns Repository 5.2 Patterns for Agile Development 5.3 Restful Service Patterns 5.4 Solution with semaphore

	5.5 Patterns and Pattern combination in practice 5.6 Big Ball of Mud Self-Study : Pattern Languages
Reference Books	19. Design Patterns: Elements of Reusable Object-Oriented Software, Erich Gamma, Richard Helm, Ralph, John, Addison Wesley 20. Head First Design Patterns, Eric Freeman, O'Reilly 21. Design Patterns in C#, Vaskaran Sarcar, Apress 22. Design Patterns in Modern C++, Reusable Approaches for Object-Oriented Software Design, Dmitri Nesteruk, Apress 23. Modern C++ design: generic Programming and design patterns applied, Alexendrescu, Andrei, Addison-Wesley 24. Java Design Patterns: A Hands-on Experience with Real-World Examples, Vaskaran Sarcar, Apress
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30 % internal assessment and 70% external assessment

Course: 303: Network Essentials and its Security

Course Code	303
Course Title	Network Essentials and its Security
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	To make students learn Network essentials and various security measures for the challenges to which the IT industry is exposed
Course Objective	To understand Network Management and its security
Pre-requisite	Computer Network, TCP/IP
Course Outcome	Students will be able to solve and determine best solutions for the challenging area of Network Security
Course Content	Unit 1: Network Essentials 1.1 Repeaters & Bridges 1.1.1 LAN Expansion 1.1.2 Repeaters 1.1.3 Bridges 1.1.4 How Bridges Work 1.1.5 Creating the routing table 1.1.6 Segmenting Network Traffic 1.1.7 Remote Bridges 1.1.8 Differentiating between bridges and repeaters 1.2 Routers & Gateways 1.2.1 Routers 1.2.2 How routers work 1.2.3 Routing benefits 1.2.4 Routing protocols 1.2.5 Routing V/S Bridging 1.2.6 B Routers 1.2.7 Gateways 1.2.8 How Gateways work 1.3 Network Administration 1.3.1 Bottlenecks 1.3.2 Simple Network Management Protocol 1.3.3 Data Protection 1.3.4 Backup Methods 1.3.5 Testing and Storage 1.3.6 Implementing a Backup System 1.3.7 Uninterruptible Power Suppliers 1.3.8 How Gateways work 1.3.9 Implementing Fault Tolerant Systems 1.3.10 RAID 1.3.11 Sector Sparing 1.4 Advance WAN Transmission 1.4.1 Overview 1.4.2 Multiplexing, Packet and Circuit Switching Networks 1.4.3 X.25 1.4.4 Asynchronous Transfer Mode (ATM) 1.4.5 ISDN 1.4.6 SONET 1.4.7 SMDS Unit 2: Introduction to Network Security Unit 3: Cryptography Techniques 3.1 Classical Cryptography

	3.2 Conventional Cryptography 3.2.1 DES 3.3 Public – key Cryptography 3.3.1 RSA 3.4 Digital Signatures 3.4.1 DSA Unit 4: Security Services 16.1 Message Integrity 16.2 Confidentiality and Authentication 16.3 Certification and Key Management 4.3.1 PKI Unit 5: Network Security Applications 5.1 IP Security 5.1.1 IPsec 5.2 Web Security 5.2.1 SSL, TLS, SET 5.3 Electronic Mail Security 5.3.1 PGP, S/MIME 5.4 SNMP Security Unit 6: Access Control in Computer Networks 6.1 Authentication Protocols and Services 6.1.1 Kerberos and X.309 6.2 Firewalls 6.3 Virtual Private Networks (VPNs) Unit 7: System Security 7.1 Intrusion detection 7.2 Viruses Unit 8: Mobile System & E-Commerce Securities 8.1 3G Security 8.2 E-Payment Systems 8.3 Fair Data Exchange
Reference Books	1. Cryptography and Network Security, 2/e, ISBN: 0-13-869017-0 - W. Stallings - Pearson Education, 1999 2. Network Security Essentials: Applications and Standards, 1/e, ISBN: 0-13-016093-8 - W. Stallings - Pearson Education, 2000 3. SSL and TLS: designing and building secure systems, ISBN: 0-201-61598-3 - E. Rescorla - Addison-Wesley, 2001 4. Implementing Secure Intranets and Extranets, ISBN: 0-89006-447-4 - K M Phaltankar - Artech House Publishers, 2000 5. Secure Electronic Commerce: Building the Infrastructure for Digital Signature and Encryption, ISBN: 0-13-027276-0 - W. Ford, and M. Baum - Prentice Hall, 2001 6. Security in Computing, ISBN: 0-13-185794-0, 2/e - C. P. Pfleeger - Prentice Hall, 1997 7. Building Internet Firewalls, 2/e, ISBN: 1-56592-871-7 - E. D. Zwicky, et al - O'Reilly, 2000 8. CDMA Cellular Mobile Communications & Network Security, ISBN: 0-13-598418-1 - M. Y. Rhee, - Prentice Hall, 1998 9. Journal of Computer Security 10. ACM Transactions on Information and System Security 11. ACM Conference on Computer and Communications Security 12. IEEE Symposium on Security and Privacy

	13. Internet documents - RFCs (Request for Comments) 14. Guide to Networking Essentials, Fourth Edition - Greg Tomsho, et al 15. Computer Networking Essentials - Debra Littlejohn Shinder 16. Networking Essentials: Hands-On, Self-Paced Training for Supporting Local and Wide Area Networks - Microsoft Corporation (Corporate Author) 17. Computer Network - A. S. Tanenbaum
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 304: Advanced Database Administration

Course Code	304
Course Title	Advanced Database Administration
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Understanding advanced database administration
Course Objective	To learn advanced database administration, database tuning and maintenance
Pre-requisite	RDBMS
Course Out come	After studying the course, students will be able to perform Database Administration
Course Content	Unit 1. Oracle10g Instance creation and management 1.1 Oracle Instance 1.2 Installing Oracle 1.3 Oracle Optimal Flexible Architecture (OFA) 1.4 Locating initialization, listener.ora & sqlnet.ora files 1.5 Finding the alert log 1.6 Common environment variables 1.7 Structures in an Oracle Instance 1.8 Oracle Memory Structures, SGA and PGA 1.9 Oracle Processes and their purposes 1.10 Startup, nomount, mount and open database commands Unit 2. Oracle10g Database Architecture 2.1 Oracle10g management framework 2.1 Using the Database Creation Assistant (DBA) 2.3 Creating and dropping a database 2.4 Tablespaces 2.5 Tables and Indexes 2.6 Clusters 2.7 Partitioning of Tables and Indexes 2.8 Gathering and applying patches Unit 3. Concurrency Management 3.1 Transactions, serialization, locks and latches 3.2 Lock modes 3.3 Detecting and resolving lock conflicts 3.4 Managing deadlocks Unit 4. Interfacing with Oracle 4.1 Oracle transaction management 4.2 Using SQL*Plus and iSQL*Plus 4.3 Using embedded Oracle with Pro*C & Java 4.4 PL/SQL & Triggers 4.5 Pining PL/SQL packages & compiling PL/SQL 4.6 System-level triggers – startup trigger, logon trigger, PL/SQL error trigger Unit 5. Oracle*Net 5.1 Basic Network structure 5.2 Oracle*Net Files 5.3 Multi-threaded server 5.4 Create additional listeners 5.5 Create Oracle Net service aliases

- 5.6 Configure connect time failover
- 5.7 Oracle*Net names resolution

Unit 6. Tablespace Management Overview

- 6.1 Dictionary Managed Tablespaces
- 6.2 Locally Managed Tablespaces
- 6.3 Automatic Segment Space Management
- 6.4 Moving tablespaces online and offline

Unit 7. UNDO Tablespace Management

- 7.1 Use of undo segments
- 7.2 Creating an undo tablespace
- 7.3 User managed undo tablespaces
- 7.4 Automatic undo management
- 7.5 Monitor & Configure undo retention
- 7.6 Use the Undo Advisor
- 7.7 Size the undo tablespace

Unit 8. Oracle Utilities

- 8.1 Datapump - Import/export
- 8.2 SQL*Loader
- 8.3 Oracle Streams
- 8.4 Automatic Database Diagnostic Monitor
- 8.5 Automatic Tuning Optimizer
- 8.6 Automatic Shared Memory Tuning

Unit 9. Oracle Performance Tuning

- 9.1 Locate invalid and unusable objects
- 9.2 Gather SQL optimizer statistics with dbms_stats
- 9.3 Basic Oracle performance metrics
- 9.4 Use OEM and dbms_alert to set warning and critical alert thresholds
- 9.5 The SQL Tuning Advisor
- 9.6 The SQL Access Advisor
- 9.6 Interpreting server generated alerts
- 9.7 Oracle advisory utilities v\$db_cache_advice, v\$shared pool_advice, v\$pga_aggregate_target_advice
- 9.8 Using OEM performance screens
- 9.9 Fixing performance issues

Unit 10. User Management

- 10.1 Creating Users
- 10.2 Altering users
- 10.3 User Profiles
- 10.4 User resource groups
- 10.5 Granting privileges & roles
- 10.6 Auditing user activity with dbms_audit

Unit 11. Oracle Security

- 11.1 Password use in Oracle, Password encryption and password aging, External authentication, Using Single sign-on (SSO)
- 11.2 Object security
- 11.3 Virtual Private Databases (VPD) in Oracle
- 11.4 Oracle “grant execute” security
- 11.5 Use of Roles in Oracle
- 11.6 Register for security updates

Unit 12. Backup & Recovery

	12.1 Oracle backup & recovery planning 12.2 Parallel instance recovery 12.3 Basics of checkpoints, redo log files, and archived log files 12.4 Using ARCHIVELOG mode 12.5 Creating consistent Oracle backups 12.6 Online hot backups 12.7 Incremental Oracle backups 12.8 Automating database backups with dbms_scheduler 12.9 Monitor the flash recovery area 12.10 Recovering from loss of a Control file 12.11 Recovering from loss of a Redo log file 12.12 Recovering from loss of a system-critical data file 12.13 Recovering from loss of a non system-critical data file
Reference Books	1. Essentials : Oracle Database 10g by Rick Greenwald, Robert Stackowiak, Jonathan Stern, O'Reilly 2. Oracle High Performance Tuning for 9i and 10g by Gavin Powell, Digital Press 3. Oracle Database 10g, DBA Handbook by Loney, Kevin, Bryla, Bob, Oracle Press 4. Oracle Database 10g - The Complete Reference by Loney, Kevin, Oracle Press 5. Oracle Database 10g: A Beginner's Guide by Micheal Abbey, Ian Abramson Osborne, Oracle Press Series
Teaching Methodology	Class work, Discussion, Self-Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 305: Open Source Web Based Programming

Course Code	305
Course Title	Open Source Web Based Programming
Credit	4
Teaching per Week	4 Hrs.
Minimum weeks/ Semester	15 (Including Class work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand fundamentals of Open Source web based Programming. The course also imparts students learning about Open source web based scripting language PHP and Mysql database. It also includes MVC or Three tier architecture of web based programming and Javascript technology like ReactJS.
Course Objective	Student will learn fundamentals and advance topics of Open source Web technology
Pre-requisite	Knowledge of HTML, Javascript and SQL
Course Out come	After studying the course, students will be able to understand how Open source web technology works. They will also be able to create database driven Websites.
Course Content	Unit 1 : Introduction to Open source Web based Programming 1.1 Introduction to PHP & MySql 1.2 Installation of PHP and MySql 1.3 Language Characteristics & Features 1.4 Operators and Variables, Control Structures, Looping and Error handling 1.5 PHP functions 1.5.1 String Functions 1.5.2 Array Functions 1.5.3 Mathematical Functions 1.5.4 Graphics Library (GD Support) 1.5.6 Date and Time Functions 2.5.7 Misc. Function 1.6 State management Techniques 1.7 Object Oriented Features of PHP 1.7.1 Classes and Objects 1.7.2 Use of constructors 1.7.3 Serialization 1.7.4 Inheritance Unit 2 : MySQL database server 2.1 Configuring the MySQL Server 2.2 MySQL Tables, Displaying MySQL Database , Adding and removing user access 1.3 Database connection and data processing functions Unit 3 : Advance PHP 3.1 Ajax Basics 3.1.1 HTTP Request and Response Fundamentals 3.1.2 The XMLHttpRequest Object XMLHttpRequest Methods 3.1.3 XMLHttpRequest Properties 3.1.4 Cross-Browser Usage Sending a Request to the Server 3.1.5 PHP and Ajax Client-Driven Communication 3.1.6 Server-Side Processing Expanding and Contracting Content 3.1.7 Form Validation 3.1.8 Ajax-Based Database Querying 3.2 XML 3.3 Web services

	Unit 4 : MVC 4.1 Introduction to MVC 4.2 CodeIgniter: Introduction, Features and Application Flow Chart 4.3 Controller 4.4 Views 4.5 Models 4.6 Helpers 4.7 Creating and Usage of Libraries and Helpers 4.8 URL Routing 4.9 Error Handling 4.10 Profiling Application Unit 5 : Introduction to React JS 5.1 What is React JS 5.2 Environment Setup 5.3 JSX and ES6 5.4 Components 5.5 Props and State 5.6 Components API and Lifecycle 5.7 Forms and Events 5.8 Difference between React JS and React Native
Reference Books	1. Beginning PHP, Apache, MySQL Web Development - Elizabeth Naramore, Jason Gerner , Yann Le Scouarnec,Jeremy Stolz,Michael K. Glass, Gary Mailer – Wrox Publication 2. Professional PHP Programming - Jesus Castagnetto ,Wrox Press Ltd 3. Beginning PHP and MySQL: From Novice to Professional - W. Jason Gilmore, Apress 4. Php: The Complete Reference - Steven Holzner, Tata Mcgraw Hill Education Private Limited 5. AJAX and PHP: Building Responsive Web Applications - Bogdan Brinzarea, Cristian Darie packtpub 6. CodeIgniter for Rapid PHP Application Development - David Upton ,packtpub 7. Professional CodeIgniter- Thomas Myer, Wrox Press Ltd 8. Learning React - Kirupa Chinnathambi , Paperback – 2018 9. Mastering React- Adam Horton and Ryan Vice, packtpub 10. Php manual – www. Php.com
Teaching Methodology	Class work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on semester end University External examination

Course: 306: Programming Skills VIII

Course Code	306
Course Title	Programming Skills VIII
Credit	2
Teaching per Week	2 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	Learn practically IoT / ML
Course Objective	Learn IoT practically, understand the working of Micro-Controller & Micro-Computer and using various types of sensors and its Programming. OR Implement various algorithms used in Machine learning and introduce students with Programming in ML.
Pre-requisite	C/C++ for IoT OR Python Programming for ML
Course Outcome	After successful completion, students will be able to work with different types of Micro-Controllers, Micro-Computers and sensors for their IoT based application development. OR After successful completion, students will be able to work with different types of ML algorithms and ML based application development.
Course Content	Practical based on paper no 301. (IoT/ML) Separate journal to be prepared for this subject 301.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 307: Programming Skills IX

Course Code	307
Course Title	Programming Skills IX
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to understand the Networking and its security practically
Course Objective	Learning to implement Network and its security practically.
Pre-requisite	Network fundamentals
Course Outcome	After studying the course, students will be able to practically implement network and its security
Course Content	Practical based on paper no 303. Separate journal to be prepared for this subject 303.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 308: Programming Skills X

Course Code	308
Course Title	Programming Skills X
Credit	2
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to learn network administration
Course Objective	Students will learn administration of network practically
Pre-requisite	Networking fundamentals
Course Outcome	After studying the course, students will be able to practically perform administrative tasks of networks practically
Course Content	Practical based on paper no 304. Separate journal to be prepared for this subject 304.
Reference Books	-----
Teaching Methodology	Lab work, Practical Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

Course: 309: Programming Skills XI

Course Code	309
Course Title	Programming Skills XI
Credit	3
Teaching per Week	3 Hrs.
Minimum weeks/ Semester	15 (Including Lab. work, examination, preparation, holidays etc.)
Review / Revision	June 2021
Purpose of Course	This course helps students to implement the basic and advanced concepts of PHP/MySQL practically.
Course Objective	Learning to develop and deploy websites using PHP/MySQL practically.
Pre-requisite	Basic scripting, programming, html.
Course Outcome	After studying the course, students will be able to practically develop dynamic websites using PHP/MySQL.
Course Content	Practical based on paper no 305. Separate journal to be prepared for this subject based on 305.
Reference Books	-----
Teaching Methodology	Lab work, Practical Programming Exercises (to be documented in a separate journal), Self-study, and/or Assignment
Evaluation Method	30% Internal assessment is based on Lab attendance, practical test, practical internal examination etc. 70% assessment is based on semester end University External practical examination

MCA

4th Sem.

Course: 401: **Seminar**

Course Code	401
Course Title	Seminar
Credit	6
Review / Revision	June 2021

- The students are required to prepare a seminar on a relevant topic concerning the subject of interest of the student; as well as latest technology.
- The students must prepare documentation of the seminar.
- At the end of the semester, the students have to submit the seminar reports in spiral bounded form to the institution.
- Seminar Completion Certificate issued by the institute is mandatory for appearing in Seminar Presentations.
- The Seminar Presentation will be conducted as per the University exam schedule.

The students have to submit the following reports at the institution:

1. Seminar Topic Chosen
2. Institution Certificate for Seminar

Course: 402: **Project**

Course Code	402
Course Title	Project
Credit	24

- The students are required to carry out full time software development project in a company.
- The students must prepare documentation of the project completed as per the guidelines given by the institute.
- At the end of the semester, the students have to submit the project reports in bounded form to the institution.
- Project Completion Certificate issued by the institute is mandatory for appearing in Project Presentation and Viva – Voce.
- The Project Presentation and Viva – Voce will be conducted as per the University exam schedule.

The students have to submit the following reports at the institution:

1. Project Joining Report
2. Progress Reports
3. Project Completion Certificate from the company
4. Institution Certificate for Project
5. Non-disclosure of Source Code Certificate (In case the student is unable to submit project source code)

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
Syllabus for S. Y. B. Sc 3rd Semester (Computer Science)
with effect from June 2021

Name of Program	Bachelor in Computer Science
Abbreviation	B.Sc.(Computer Science)
Duration	3 Years (Full Time – Regular Course)
Eligibility	Candidate must have passed standard 12th (H.S.C.) Examination in Science stream through Gujarat Higher Secondary Board (G.H.S.E.B.) or any other equivalent board (C.B.S.E. / I.C.S.E.) with English subject. Students passed with vocational stream in 12th (H.Sc.) are also eligible. Candidate passed ITI and Diploma are eligible as per the norms of Gujarat Government.
Objective of the Program	The basic objective of the program is to open a channel of admission for computing courses for students, who have done the 10+2 and are interested in taking computing/IT as a career. The program caters to the needs of the students aspiring to excel in the fields of computers. The program is designed to develop computer professionals versatile in almost all field of computer application .The main emphasis of the course is preparing students in the field of computer science and application areas of computer science including software development skills.
Program Outcome	It will open field for the aspiring students to opt further career or masters' level study in the fields of Research, Design, Architecture and software development. It is also preparing aspiring students to work in companies at entry levels and also independently.
Medium of Instruction	English
Program Structure	Three years of Graduate level course comprises of six semesters.

Course Structure for Second Year B.Sc.(Computer Science) Semester-III

Course	Paper Code	Paper Title	Theory (Marks)		Practical (Marks)		Total Credits
			Internal	External	Internal	External	
Core Compulsory	301	Object Oriented Programming: C++	20	50	10	20	3
	302	System Development using c# .Net	20	50	10	20	3
	303	Relational Database Management System - 1	20	50	10	20	3
IDS: Can course	ID-01 ID-02 ID-03	E-Commerce and Cyber Security Computerized Accounting Business Systems	20	50	-	-	2
Foundation Elective (to be selected from NCC / NSS / Saptadhara)			NIL	-	-	-	2
Total:							13

For Practical:

1. Batch Size – 25 Maximum
2. The journal should be certified by the concerned faculty and also by the Head of the Department, failing which the student should not be allowed to appear for External Practical Examination.
3. P.N.: In case of Generic Elective Paper available in both semesters, it can be opted only during one semester. The same title cannot be repeated in another semester.

Course Code	Theory		Practical		University Examination (Theory + Practical)		Internal Marks	Total Marks
	Credit	Hours	Credit	Hours	Duration	Marks		
301	2	2	1	2	2	50+20	20+10	100
302	2	2	1	2	2	50+20	20+10	100
303	2	2	1	2	2	50+20	20+10	100
IDS: Can course	2	2	-	-	2	50	20	70
Total:	8	8	3	6	8			

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-III
Effective From: June 2021
Course: 301: Object Oriented Programming: C++

Course Code	301
Course Title	Object Oriented Programming : C++
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Object Oriented Programming Language. The concepts of class, objects and related features of OOPs are covered in this course. The course is aimed to give inner depth of Object oriented programming language concepts.
Course Objective	To make students understand concepts of Class and Objects. To make students understand concepts of Inheritance, Polymorphism. To make students understand the basic concepts of Constructors/Destructors. To make students understand function overloading, operator overloading, virtual functions. To make students understand concepts of arrays, pointers, dynamic memory allocation
Pre-requisite	Concepts of C programming Language.
Course Out come	At the end of the course, student is expected to have clear concepts about the Class, Objects and related terminologies. Students can apply object oriented concepts which is essential for further studies.
Course Content	Unit 1: Introduction to OOP 1.1 Introduction to OOP, Features of OOP, Advantages of OOP 1.2 Difference between OOP and Procedural programming 1.3 Class, Object, Data member, member function 1.4 Access specifier - private, public, protected 1.5 Constructor and destructor, parameterized constructor, copy constructor, default constructor 1.6 Nested classes. 1.7 Inline function, default arguments 1.8 Friend functions, friend classes 1.9 Array of objects 1.10 new, delete operators and this pointer Unit 2: Inheritance 2.1 Base and derived class 2.2 Single inheritance 2.3 Multilevel and Multiple inheritance 2.4 Hybrid inheritance 2.5 Using constructor in inheritance 2.6 Abstract base class

	Unit : 3 Polymorphism 3.1 Overloading and overriding 3.2 Function overloading 3.3 Operator overloading rules and implementation 3.4 Virtual function 3.5 Early binding and late binding, runtime polymorphism 3.6 pure virtual function and its benefits Unit 4: File handling and Template 4.1 File - input and output - file opening modes 4.2 text and binary files 4.3 read, write operations <u>4.4 Benefits of text and binary files.</u>
Reference Books:	1. The complete reference C++ : Herbert Schildt, TMH. 2. Object Oriented Programming in C++ : Robert Lafore - Galgotia Publication. 3. C++ : Effective Object Oriented Software Construction - Kayshav Dattari. 4. Object Oriented Programming using C++ - Addison Wesley. 5. Object Oriented Programming in C++ - Balaguruswamy.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-III
Effective From: June 2021
Course: 302: System Development using C#.Net

Course Code	302
Course Title	System Development using C#.Net
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of primarily an integrated, interactive development environment (“IDE”). The visual studio-IDE has been highly optimized to support rapid application development (“RAD”). It is particularly easy to develop graphical user interfaces and to connect them to handler functions provided by the application.
Course Objective	To make students understand concepts of GUI and .NET Framework. To make students able to develop desktop based applications along with databases.
Pre-requisite	Concepts of GUI.
Course Out come	At the end of the course, student is expected to have clear concepts about the GUI, IDE, CLR and Rapid Application development Tool. Students can understand the concept of front-end tool as a base for developing interactive project.
Course Content	Unit-1: OVERVIEW OF MICROSOFT .NET FRAMEWORK 1.1. What is .net framework & its benefits 1.2. The Common Language Runtime(CLR), Purpose of CLR 1.3. Managed/Unmanaged code, Compilation & Exception 1.4. Memory Management, Garbage Collection 1.5. The .Net Framework Class Library. 1.6. Introduction to MS Visual Studio .NET Unit-2: C#.NET PROGRAMMING LANGUAGE 2.1 Data Types, Types Conversion Functions, Operator & Exceptions 2.2 Variable Declaration : Level, Lifetime, Scope & Accessibility 2.3 Decisions Structures 2.4 Loop Statements: While, Do.... Loop, For...Next, For Each...Next 2.5 Nested Control Statements, Exit Statement 2.6 Exception Handling 2.6.1 Exception Handling Overview , 2.6.2 Structures Exception Handling, Debugging

	Unit-3: Designing Using Interface 3.1 Working with Forms 3.2 Basic Windows Controls 3.3 Menus, Timer, Common dialog control, Rich Textbox 3.4 Treeview & Listview controls, Toolbar, Statusbar 3.5 SDI & MDI Application Unit-4: Data Access 4.1 History of Microsoft Data Access Technologies 4.2 Overview of ADO.NET 4.3 The Server Explorer & Query Builder 4.4 ADO.NET Object Model 4.5 Programming ADO.NET-provider, Adapter, Reader, command objects 4.6 Disconnected Architecture
Reference Books:	1. Beginning c# by wrox publication 2. Programming in c# by E. Balaguruswami TMH 3. Visual C#.Net Black book by Kogent Learnig Solutions 4. Professional C# by wrox Publication
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-III
Effective From: June 2021
Course: 303: Relational Database Management System -I

Course Code	303
Course Title	Relational Database Management System –I
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Database Management System, Entity Relationship model, Relational Model, SQL (DDL, DML and DCL).
Course Objective	To make students understand concepts of Database. To make students understand concepts of Entity Relationship Management. To make students understand the basic concepts of Relational Model. To make students able to work with various SQL statements.
Pre-requisite	Concepts of Data and Data storage.
Course Out come	At the end of the course, student is expected to have clear Concepts about database, storage of data, database models, Entity and relationship, various keys and SQL.
Course Content	Unit-1: Introduction to DBMS 1.1 Concepts of Database and Database System 1.2 Requirement of database system.(data integrity, data isolation, data consistency, Data redundancy, Concurrency) 1.3 Data models and data independence 1.4 DDL, DML 1.5 Database Manager, Database Administrator. Unit-2: Entity Relationship Models 2.1 Entities and Entity sets 2.2 Relationship and relationship sets 2.3 Mapping constrains 2.4 Super Key, Candidate Key, Primary keys, Foreign Key, Unique Key 2.5 Integrity constraints-Domain, Entity and Referential 2.6 Entity Relationship diagram and reducing it to tables. 2.7 Structure of relational database. Unit-3: SQL-1 : DDL and DML statements 3.1 Overview of SQL and Database system (mySQL / SQLServer / PostgreSQL / Oracle etc), Loading and Dumping a Database. 3.2 Various data types and operators: logical, wildcard operators 3.3 DDL Statements: 3.3.1. CREATE TABLE command - Declaring Constraints,

	Table level Constraints, attribute level constraints, PRIMARY KEY constraint, FOREIGN KEY constraint, Limitation of Foreign key , On Delete Cascade 3.3.2 Altering a table, Dropping a table. 3.4. DML Statements: 3.4.1. INSERT statement, INSERT FROM statement. 3.4.2 UPDATE, UPDATE with multiple columns, Updating to NULL values, using sub queries with UPDATE command, 3.4.3 DELETE statement UNIT 4 SQL-2: DQL statements 4.1. SELECT statement- FROM and WHERE clause, ORDER BY, with NULL 4.2 Formatting Query output : Ordering output by fields, multiple columns, Aggregate Group, Column number, String and expressions , functions in query 4.3 Use of operators: Use of relational operators, use of Boolean operators, IN, BETWEEN, LIKE, NOT IN , 4. 4 Use of Table and Column Alias 4. 5 Retrieval of information from tables: GROUP BY clause, HAVING clause 4.6 Use of aggregate functions: avg(), max(), min(), sum(), count()
Reference Books:	1. Henry Kroth & Silbershats, Database System Concept. 2. C.J. Date, Introduction to Database Design, Addition Wesley, Nasora. 3. Martin Gruber, Understanding SQL, BPB Pub., New Delhi. 4. Ivan Bayross, SQL, PL/SQL The Programming Language of ORACLE, BPB Pub., New Delhi. 5. SQL / PLSQL programming By P.S. Despande wiley Dream Tech Pub. 6. J Ullman, Principles of Database Systems, Galgotia Pub., New Delhi. 7. ORACLE Manuals. 8. SQL Manuals 9. ORACLE 10g The Complete Reference, ORACLE Press, TMH, Delhi. 10. Oracle PL/SQL programming - Oracle press - Tata McGraw hill.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT

Syllabus for S. Y. B. Sc (Computer Science)

with effect from June 2021

Name of Program	Bachelor in Computer Science
Abbreviation	B.Sc.(Computer Science)
Duration	3 Years (Full Time – Regular Course)
Eligibility	Candidate must have passed standard 12th (H.S.C.) Examination in Science stream through Gujarat Higher Secondary Board (G.H.S.E.B.) or any other equivalent board (C.B.S.E. / I.C.S.E.) with English subject. Students passed with vocational stream in 12th (H.Sc.) are also eligible. Candidate passed ITI and Diploma are eligible as per the norms of Gujarat Government.
Objective of the Program	The basic objective of the program is to open a channel of admission for computing courses for students, who have done the 10+2 and are interested in taking computing/IT as a career. The program caters to the needs of the students aspiring to excel in the fields of computers. The program is designed to develop computer professionals versatile in almost all field of computer application .The main emphasis of the course is preparing students in the field of computer science and application areas of computer science including software development skills.
Program Outcome	It will open field for the aspiring students to opt further career or masters' level study in the fields of Research, Design, Architecture and software development. It is also preparing aspiring students to work in companies at entry levels and also independently.
Medium of Instruction	English
Program Structure	Three years of Graduate level course comprises of six semesters.

Course Structure for Second Year B.Sc.(Computer Science) Semester-IV

Course	Paper Code	Paper Title	Theory (Marks)		Practical (Marks)		Total Credits
			Internal	External	Internal	External	
Core Compulsory	401	Data Structure using C++	20	50	10	20	3
	402	Web Development using C#.Net	20	50	10	20	3
	403	Relational Database Management System - 2	20	50	10	20	3
IDS: Can course	ID-01 ID-02 ID-03	E-Commerce and Cyber Security Computerized Accounting	20	50	—	—	2
Foundation Elective (to be selected from NCC / NSS / Saptadhara)			NIL	-	-	-	2
Total:							13

For Practical:

1. Batch Size – 25 Maximum
2. The journal should be certified by the concerned faculty and also by the Head of the Department, failing which the student should not be allowed to appear for External Practical Examination.
3. P.N.: In case of Generic Elective Paper available in both semesters, it can be opted only during one semester. The same title cannot be repeated in another semester.

Course Code	Theory		Practical		University Examination (Theory + Practical)		Internal Marks	Total Marks
	Credit	Hours	Credit	Hours	Duration	Marks		
401	2	2	1	2	2	50+20	20+10	100
402	2	2	1	2	2	50+20	20+10	100
403	2	2	1	2	2	50+20	20+10	100
IDS: Can course	2	2	-	-	2	50	20	70
Total	8	8	3	6	8			

VEER NARMAD SOUTH GUJARAT UNIVERSITY SURAT

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-IV
Effective From: June 2021
Course: 401: Data Structure using C++

Course Code	401
Course Title	Data Structure using C++
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Data Structure. The concepts of Primitive and non-primitive data structures are covered in this course. It covers concepts of Arrays, Stack, Queue, Link list and sorting searching methods. The course is aimed to give inner depth and practical implementation of non-primitive data structures and its related applications.
Course Objective	To make students understand concepts of Primitive and non-primitive Data structure. To make students understand concepts of stack, queue and types of queues. To make students understand the implementation of Link-list and related applications. To make students understand concept of polish notation. To make students work with searching and sorting techniques.
Pr-requisite	C++ programming Language.
Course Out come	At the end of the course, student is expected to have clear concepts about the primitive and non-primitive data structure. Implementation of non-primitive data structure. Application implementation using stack, queue, link list.
Course Content	Unit 1: Introduction 1.1 Introduction data structure and its types 1.2 Array, structure, union, self referential structure 1.3 Concept of Algorithm analysis 1.4 Algorithm performance Analysis criteria (Time / Space) 1.5 Average case / Best Case / Worst case Unit 2: Linear Data Structures 2.1 Stack data structure, operations on stack (Push, Pop, Peep) 2.2 Applications of stack(Recursion, Evaluation of postfix, converting infix to postfix) 2.3 Simple Queue data structure and its operations (insert, delete and view) 2.4 Circular queue, Dequeue and Priority queue 2.5 Applications of queue (printer queue simulation, round robin Algorithm, Simulation)

	Unit 3: Non-linear data structures 3.1 Linked list - representation, advantages and disadvantages 3.2 Various operations on one way (singly) linked list 3.3 Various operations on two way (doubly) linked list 3.4 Various operations on circular linked list 3.5 Introduction to Tree and Binary tree 3.6 Tree traversal methods 3.7 Concept and Applications of Binary Search Tree (No practical implementation) Unit 4: Searching and Sorting 4.1 Searching Techniques- linear search, Binary search 4.2 Sorting - Internal and external sort 4.3 Quick sort 4.4 Merge sort 4.5 Insertion sort 4.6 Selection sort
Reference Books:	1. An Introduction to Data Structure with Applications : Trembley & Sorenson – McGraw Hill 2. Data Structures Using C & C++ - Langsam, Augenstein & Tanenbaum - PHI 3. Wirth, Niclaus, Algorith+Data Structure Programs, Prentice Hall. 4. Horwith E and Sahni S, Fundamental of Data Structure, Computer Science Press. 5. Aho A.V., Hopcrott and Ullman, Data Structure and Algorithms , Addition – Wesslely.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Note: Practical should be done using C++

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-IV
Effective From: June 2021
Course: 402: Web Development using C#.Net

Course Code	402
Course Title	Web Development using C#.Net
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	This course imparts the knowledge of web programming based on .NET technology. It covers the concepts of ASP.NET server controls, Client server communication, ADO .NET technology, Web Service Development etc. The course is aimed to give inner depth of ASP .NET technology.
Course Objective	To make students understand concepts of ASP .NET. To make students understand concepts of Server controls. To make students understand the basic concepts of client server communication. To make students understand of ADO .NET technology. To make students understand concepts of web config.
Pre-requisite	Concepts of .NET technology Framework and CLR.
Course Out come	At the end of the course, student is expected to have clear concepts about the ASP .NET. Students can apply .NET technology for implementing applications.
Course Content	Unit 1: Introduction ASP.Net Web development 1.1 Introduction to ASP.Net 1.2 Structure of ASP.Net Application 1.3 ASP.Net Application Life Cycle 1.4 ASP.Net Page Life Cycle 1.5 Request Object & Response Object 1.6 Page Class 1.7 web.config & global.asax file 1.8 Introduction to ASP.NET Core Framework and MVC architecture Unit 2: Application Designing 2.1 Basic Standard Controls 2.2 Master Page in ASP.NET 2.3 Navigation Control: Treeview, Menu & SiteMapPath 2.4 CSS, Theme & Skin file in ASP.NET 2.5 Validation Controls 2.6 AdRotator Control

	Unit 3: Accessing data using ADO.Net 3.1 Introduction to ADO.Net [Data Provider, Data Set] 3.2 Connection Object, Command Object, Data Adapter Object 3.3 Data Binding [Binding data to control Combo Box, List Box] 3.4 Data Control: Grid view control, Form view control, Listview control , Repeater control Unit 4: State Management and Web services in ASP.NET 4.1 Client-side State Management Technique 4.1.1 View State 4.1.2 hidden Fields 4.1.3 Query String 4.1.4 Cookies 4.2 Server-side State Management Technique 4.2.1 Session State 4.2.2 Application State 4.3 Web Services: 4.3.1 Introduction to web service-Architecture 4.3.2 Integration-Web Service Description Language – Accessing web service using different Clients.
Reference Books:	1. Beginning ASP.NET 4.0 in C# and VB by Imar Spaanjaars Wrox Pubs. 2. ASP.NET 4.0 – Black Book - Dream Tech 3. Professional ASP.NET in C# and VB Wrox Pubs. 4. Pro ASP .NET 4.5 in C# (Professional Apress) by Mario Szpuszta Adam Freeman, Matthew MacDonald (Author) 5. ASP.NET Core in Action by Andrew Lock Web References: http://www.asp.net http://www.w3school.com for ASP.NET http://www.tutorialspoint.com for ASP.NET
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)
Syllabus for S. Y. B. Sc. Semester-IV
Effective From: June 2021
Course: 403: Relational Database Management System - II

Course Code	403
Course Title	Relational Database Management System – II
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2018
Purpose of Course	This course imparts the knowledge of Relational Database Management System, specifically database normalization. Understanding of PL/SQL blocks structure. Exception handling mechanism and concept of package is covered. The course is aimed to give inner depth of Relational Database Management system using.
Course Objective	To make students understand and carryout Database Normalization. To make students understand concepts of PL/SQL . To make students understand the basic concepts of cursors and their types. To make students understand concepts of functions, procedures, triggers and package.
Pre-requisite	Concepts of Database management System and SQL.
Course Out come	At the end of the course, student is expected to have clear concepts about the Transaction concepts, Concurrency control, PL/SQL block structure, Error Handling , Exception handling and package
	.
Course Content	Unit-1: Relational Database Design 1.1 Functional Dependencies 1.2 Need for Normalization 1.3 Normal forms (1NF, 2NF, 3NF and B.C.N.F.) 1.4 Data Dictionary 1.5 Tables, Table spaces & Data files, Views. Unit 2 :Advanced SQL 2.1 Join Queries : 2.1.1. Basic concept of Joining table 2.1.2 Inner Join, Outer Join (Left, Right, Full),self Join 2.2 Subqueries : DISTINCT with subqueries, Predicates with subqueries, Aggregate Functions in subqueries, Correlated subqueries, Correlating tables to itself, Correlated subqueries in HAVING, UNION, INTERSECT,NOT IN. 2.3 CREAT VIEW Command : Updating views, Group views and Joins, Views and sub queries, Changing values through views, 2.4 Grant command, using ALL and PUBLIC arguments, GRANT and REVOKE OPTION.

	2.5 Introduction to Transactions, Commit, Rollback, Savepoint Unit-3:PL/SQL: 3.1. PL/SQL Block Structure 3.2 Using Variables,, Constants and Data Type 3.3 User Defined Record 3.4 Assigning Values to Variables 3.5. Control Statements (IF...THEN statement, Loop, FOR...Loop, While Loop) 3.6 Exception handling 3.7 User-Defined RECORD and TABLE data types. 3.8 Concepts of Cursor 3.8.1 Types of Cursors 3.8.2 Handling Cursors Unit 4 :PL/SQL Programs 4.1 Anonymous PL/SQL Blocks 4.2 Procedures and Functions, 4.3 Triggers 4.4 Packages
Reference Books:	1. Henry Kroth & Silbershats, Database System Concept. 2. C.J. Date, Introduction to Database Design, Addition Wesley, Nasora. 3. Martin Gruber, Understanding SQL, BPB Pub., New Delhi. 4. Ivan Baross, SQL, PL/SQL The Programming Language of ORACLE, BPB Pub., New Delhi. 5. James Martin, Computer Database Organization, PHI, New Delhi. 6. J Ullman, Principles of Database Systems, Galgotia Pub., New Delhi. 7. ORACLE Manuals. 8. SQL Manuals 9. George Koch and Kevin Loney, ORACLE 8 The Complete Reference, ORACLE Press, TMH, Delhi. 10. Oracle PL/SQL programming - Oracle press - Tata McGrawHill.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

The Enclosed papers are to be included as IDS CAN course for S.Y.B.Sc.(Computer Science) along with the existing CAN courses. Students are supposed to select one IDS in 3rd semester and one in 4th semester.

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)

Syllabus for S. Y. B. Sc.(Computer Science) – CAN course.

Effective From: June-2021

Course: ID-01: E-Commerce and Cyber Security

Course Code	ID-01
Course Title	E-Commerce and Cyber Security
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Electronic commerce, online order processing concepts and related threats. The concepts of electronic transactions, e-commerce framework, related security issues and threats are covered in this course. It also highlights the issues related to cyber crime, types of possible cyber crimes and related issues. The course is aimed to give e-commerce related issues and concepts.
Course Objective	To make students understand concepts of e-commerce framework. To make students understand concepts of types of online transactions. To make students understand the basic concepts of security issues pertaining to e-commerce. To make students understand various possible cyber crimes and its related laws.
Pre-requisite	Concepts of electronic commerce and online transactions.
Course Out come	At the end of the course, student is expected to have clear concepts about the e-commerce, types of e-commerce, e-commerce framework, security issues pertaining to e-commerce, cyber crimes and related cyber laws.
Course Content	Unit-1: 1.1 Introduction to E-commerce 1.1.1 What is E-commerce 1.1.2 E-commerce frame work 1.2. E-commerce consumer applications 1.2.1 E-commerce organization applications 1.2.2 Network for E-commerce 1.2.3 what is information way

Unit-2:E-commerce and World wide web

- 2.1 E-commerce application services
- 2.2 Consumer to Business Transaction
- 2.3 Business to Business Transaction
- 2.4 Security on the web
- 2.5 Categories of Internet data and transactions

Unit-3: E-commerce security Issues

- 3.1 Secure Socket layer
- 3.2 Types of Electronic payment systems
 - 3.2.1 E-cash
 - 3.2.2 Electronic checks
 - 3.2.3 Smart cards and electronic payment systems
 - 3.2.4 Credit card and debit cards payment and their authentication

Unit-4: Introduction to Cyber Crimes

- 4.1 Category of cyber crimes
- 4.2 Technical aspects of cyber crimes
 - 4.2.1 Unauthorized access & Hacking
 - 4.2.2 Trojan , virus and Worm attacks
- 4.3 E-mail & IRC related crimes
 - 4.3.1 Email spoofing and Spamming
 - 4.3.2 Email bombing
 - 4.3.2.1 Sending threatening emails
 - 4.3.2.2 Defamatory emails
 - 4.3.2.3 Email frauds , IRC related
 - 4.3.2.4 Denial of Service attacks
 - 4.3.2.5 A distributed denial of service attack

Unit-5: Prohibited actions on Cyber

- 5.1 Pornography
- 5.2 IPR violation , software piracy , copyright infringement, trademarks violation, theft of computer source code, patent violations
- 5.3 Cyber Squatting
- 5.4 Cyber terrorism
- 5.5 Banking/Credit card related crimes
- 5.6 E-commerce/Investment Frauds- Sales and investment frauds

	5.7 Sales of Illegal articles 5.8 Defamation(Cyber smearing) 5.9 Cyber stalking
Reference Books:	1. E-commerce Strategies --- Charle s Trepper 2. E- Commerce an Indian Perspective—Joseph- PHI 3. Electronics Commerce : A Managerial Prespective – Efraim Turban, Jae Lee 4. Cyber Crime in India ---- Dr M Dasgupta 5. Cyber Law and Crimes – BarkhaU, Rama Mohan 6. Cyber Laws Law---Dr Sarla Gupta 7. Email Hacking - Ankit Fadia 8. Ethical hacking Guide to Corporate Security—Ankit Fadia
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)

Syllabus for S. Y. B. Sc.(Computer Science) – CAN course.

Effective From: June-2021

Course: ID-02: COMPUTERISED ACCOUNTING

Course Code	ID-02
Course Title	Computerised Accounting
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June, 2018
Purpose of Course	This course imparts the knowledge of Introduction to Accounting System, Accounting Concepts, Accounting Equation & Transaction Analysis, Concepts of Book-Keeping and accounting package. The course is aimed to give inner depth of Accounting and Book keeping concepts.
Course Objective	To make students understand concepts of Accounting system. To make students understand concepts of Book Keeping. To make students understand the basic concepts of Accounting Equations & Transaction Analysis. To make students understand computerized accounting package.
Pre-requisite	Concepts of Accounts and basic knowledge of computerized application package.
Course Out come	At the end of the course, student is expected to have clear concepts about the Accounting System, Accounting Concepts, Accounting Equation & Transaction Analysis, Concepts of Book-Keeping and accounting package. Students can apply Accounting and Book Keeping concepts which are to understand commercial accounting packages.
Course Content	Unit-1: Fundamentals of Accounting 1.1.Introduction to Accounting System 1.1.1 Meaning & Definition of Accounting 1.1.2 Objectives of Accounting 1.1.3 Concepts and Features of Book Keeping 1.1.4 Branches of Accounting (Financial Management, Cust) 1.1.5 Basis of Accounting (Accrual Bases, Cash Bases) 1.2. Accounting Concepts 1.2.1 Accounting Concept

	1.2.2 Accounting Equation Concept 1.2.3 Accounting Period Concept 1.2.4 Concept of Matching Realization Accrual Unit-2: Accounting Equation & Transaction Analysis 2.1 Accounting Equation & Transaction Analysis 2.1.1 Introduction to Assets, Liabilities, Equities 2.1.2 Concepts of Transaction Analysis 2.1.3 Classification of Accounts (Real Account, Personal Account, Nominal Account) 2.2 Concepts of Book-Keeping 2.2.1 Introduction of Single Entry System and its advantages/disadvantages 2.2.2 Introduction of Double Entry System and its advantages 2.2.3 Types of Business Transaction 2.2.3.1 Cash Transaction 2.2.3.2 Credit Transaction 2.2.3.3 Barter Transaction Unit-3: Journal & Subsidiary Books (With Preliminary examples) 3.1 Meaning of Journal 3.2 Format of Journal 3.3 Concept and format of cash Book 3.4 Concept and format of Petty cash Book Unit-4: Concept of Accounting Mechanism 4.1 Meaning and Definition of Ledger 4.2 Types of Ledger 4.3 Concepts of posting Bank Reconciliation Statement 4.4 Trial Balance and its objectives 4.5 Concepts of Suspense Account Unit-5 Application of Accounting Using Accounting Package 5.1 Creation of Company 5.2 Voucher Printing Entry 5.3 Alteration, Deletion of Vouchers 5.4 Types of Voucher entry (Receipt, Payment, Contra, Purchase, Sales, Journal, Physical Stock, Reversing Journal) 5.5 Generating Trial Balance 5.6 Maintaining Account Books & Reports
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	5.6.1 Cash Book, Bank Book, Ledger 5.6.2 Sales Register, Purchase Register 5.6.3 Day Book, Inventory Book, Stock Summary 5.6.4 Balance Sheet
Reference Books:	1. Accounting for Management – By Dr. Hawaharlal 2. Financial Management - By Dr. S.N. Maheshwari 3. Accounting for Management – By S.K. Bhattacharya & John Deardon 4. Advanced Accountancy – By S.P. Jain & K.I. Narang 5. Implementing Tally 6.3 – By K.K. Nathani – BPB Publication 6. Implementing Tally 7.2 – By A.K. Nathani & K.K. Nathani BPB Publication
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

VEER NARMAD SOUTH GUJARAT UNIVERSITY – SURAT
S Y B. Sc. (Computer Science)

Syllabus for S. Y. B. Sc.(Computer Science) – CAN course.

Effective From: June-2021

Course: ID-03: Business Systems

Course Code	ID-03
Course Title	Business Systems
Credit	2
Teaching per Week	2 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June-2018
Purpose of Course	This course imparts the knowledge of various business information systems needed to be model, design and program as software engineer.
Course Objective	To provide comprehensive knowledge of concepts related to various business information systems To provide basics for system and data modelling. To provide insight into business operations and their significance in information system
Pre-requisite	Concept of information system
Course Out come	At the end of the course, student will be able to 1. Understand business operations and related information systems. 2. Perform system and data modelling for given business information system
Course Content	Unit 1 Introduction 1.1 Introduction to Business Data Processing 1.2 Overview of Business systems 1.3 Management Functions, Levels of Management 1.4 Sources of Information, Applications like Payroll, Accounting, Inventory, MIS, DSS 2. Inventory Control System 2.1 Objectives of good inventory control system 2.2 Transaction for an inventory system (Purchase, Issue, Purchase Return and Issue Return) 2.3 Creation of transaction file, Item master file for purchase, issue, purchase return and sales return. 2.4 Consumption analysis, A B C analysis, Year-end processing and Periodic housekeeping

	3. Payroll System 3.1 Objectives of payroll systems 3.2 Classification of employees based on payment of wages 3.2.1 Monthly dated employees 3.2.2 Daily rated employees (Time rated employees, Piece rate employees) 3.3 Leave entitlements, Overtime wages, bonus, provident fund contribution and other deductions 3.4 Computerizing a Payroll system: Case Study 4. Banking System 4.1 Objectives of banking systems 4.2 Present level of computerization 4.3 IT packages and services in India 4.4 Core modules and reports 4.5 Internet Banking 4.6 e-Banking in India 4.7 Business payment solutions 5. Services Oriented Business System & ERP 5.1 Service Definition, Types of Services 5.2 Process of Services, Effects of Services, Software as a Service 5.3 Evolution of ERP, Definition of ERP, Various Modules of ERP, Advantage of ERP. 5.4 Case study based on ERP.
Reference Books:	1. Business applications using computers Ramachandran Nambissan T.M BPB publications 2. Enterprise resource planning Alexis Leon Tata McGrawhill 3. Services Marketing People, Technology, Strategy: Chrestopper Lovelock and Jochen Wirtz - Pearson Education. 4. Production And Operations Management: K. Aswathappa And Shrddhara Bhat, Himalaya Publishing House. 5. Retailing Management: Levy writz - TMH. 6. Logistics And Distributed Management: Alan Rushton, John Oxley Phil Croucher -Kogan Page.
Teaching Methodology	Discussion, Independent study, Seminars and Assignment
Evaluation Method	30% Internal assessment is based on class attendance, participation, class test, quiz, assignment, seminar, internal examination etc. 70% assessment is based on end semester written examination

Course : 103 : Fundamentals of Computer

Course Code	103
Course Title	Fundamentals of Computer
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	This course helps students to understand basics of computer and office tools
Course Objective	The students would be able to understand the basic uses and applications of computer, to know different components of computer, to get familiar with various computer codes, basics of operating system, configuration and maintenance of open source operating system, its commands. The student would also learn open source office tools.
Pre-requisite	NIL
Course Out come	Students will be able to understand better use of computer and its operations.
Course Content	Unit : 1 : Introduction to Computers and its components 1.1 Computer 1.1.1. Introduction to Computer 1.1.2. The Components of Computer 1.1.3. Advantages and Disadvantages of Computer 1.1.4. Generations of Computer 1.1.5. Computer Software 1.1.6. Categories of Computers 1.1.6.1 Personal Computers 1.1.6.2 Mobile Computers 1.1.6.3 Servers 1.1.6.4 Mainframes 1.1.6.5 Super Computers 1.1.6.6 ATM 1.1.6.7 POS 1.1.7. Usage and Applications of Computer in Society 1.2. Components of Computer 1.2.1 Block Diagram of Computer 1.2.2 The System Unit 1.2.3 Processor 1.2.4 Motherboard 1.2.5 Memory - Register, RAM, ROM 1.2.6 Expansion Slots and Adaptor Cards 1.2.7 Ports and Connectors 1.2.8 Buses 1.2.9 Power Supply 1.2.10 Input Output Systems 1.2.11 Storage Systems 1.2.12 BIOS 1.2.13 Interrupt 1.2.14 Device Driver Unit : 2 : Computer Codes and Conversions 2.1 Computer Codes 2.1.1 Introduction to Computer Codes 2.1.2 Decimal System 2.1.3 Binary System

	2.1.4 Hexadecimal System 2.1.5 Octal System 2.1.6 4-bit BCD System 2.1.7 8-bit BCD System 2.1.8 ASCII code 2.1.9 16-bit Unicode 2.2 Conversion of Numbers (from one Number System to another - includes fixed and fractional numbers) Unit : 3 : Operating System and Usage 3.1 Types of OS 3.1.1 Single User 3.1.2 Multi - User 3.1.3 Uni - Processor 3.1.4 Multi - Processor 3.1.5 Batch Processing 3.1.6 Time - Sharing 3.1.7 Real Time 3.2 Booting Process of Computer 3.7 Need of OS 3.6 Functions of OS 3.3 Types of File System - FAT, NTFS, APFS, EXT 3.4 Partition of Disk 3.5 Installation of OS Unit : 4 : Introduction to Open Source OS : Linux 4.1 Features and Components of Linux 4.2 Components of Linux 4.3 Installation and Configuration of Open Source Software 4.3 Basic Commands – cat, cmp, diff, wc, sort, mkdir, rmdir, cd, ls, cp, mv, pwd, passwd, who, whoami, chmod, date, more, sudo, apt-get, install, update, upgrade. Unit : 5 : Open Office 5.1 Open Office – Writer 5.1.1 Working with Documents 5.1.2 Formatting Documents 5.1.3 Setting Page style 5.1.4 Creating Tables 5.1.5 Drawing- Tools 5.1.6 Printing Documents 5.2 Open Office – Calc 5.2.1 Introduction to Spreadsheets 5.2.2 Overview of a Worksheet 5.2.3 Creating Worksheet & Workbooks 5.2.4 Organizing files, Managing files & workbooks 5.2.5 Functions & Formulas 5.2.6 Working with Multiple sheets 5.2.7 Creating Charts & Printing Charts 5.3 Open Office – Impress 5.3.1 Creating Presentation, Saving Presentation Files 5.3.2 Master Templates & Re-usability 5.3.3 Slide Transition 5.3.4 Making Presentation CDs
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	5.3.5 Printing Handouts
Reference Book	1. Fundamentals of Computer : E Balagurusamy - McGraw-Hill 2. Computer Fundamentals : P.K. Sinha - BPB Publications 3. OpenOffice.org for Dummies : Gurdy Leete - Wiley-India 4. Computer Fundamentals : Anita Goel - Pearson 5. Fundamentals of Computer : Rajaraman V. - PHI 6. Fundamentals of Computers : Reema Thareja - Oxford University Press
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 104 : Fundamentals of Programming Using C-I

Course Code	104
Course Title	Fundamental of Programming using C-I
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To provide fundamental knowledge of programming using C language.
Course Objective	To make students aware of problem solving methodology to solve problems and design solutions.
Pre-requisite	NIL
Course Out come	Students will be able to solve problems, to write algorithms of solutions and translate solutions into programs.
Course Content	Unit : 1 : Phases of Problem Solving Methodology 1.1 Problem Analysis Gathering available data, Identifying relevant facts, Defining the problem, Generating alternative methods of solution, Selecting the optimum approach 1.2 Problem solving techniques Simplification, Divide and conquer: break down a large, complex problem into smaller solvable problems, Constraint examination 1.3 Algorithm 1.4 Flowchart Unit : 2 : Introduction to Computer Programming 2.1 Introduction to Computer Programming Language and Program 2.2 Programming languages and Levels 2.3 Language Translators 2.3.1 Compiler 2.3.2 Interpreter 2.3.3 Assembler 2.4 Program Verification 2.4.1 Program Correctness 2.4.2 Program Bugs & Testing Unit : 3 : Introduction to C language 3.1 Overview of C 3.2 Constants, Variables and Data types 3.3 Operators and expressions 3.4 Simple Assignment statement 3.5 Basic Input/Output Statements 3.6 Decision Making Statements 3.7 Looping 3.8 Nested Control Structures Unit : 4 : Array 4.1 One dimensional Array 4.2 Declaration & Initialization of Array 4.3 Two dimensional array 4.3.1 Declaration 4.3.2 Accessing Matrix Elements 4.3.3 Operations on matrix elements and entire matrices 4.4 Array manipulation 4.4.1 Searching 4.4.2 Insertion

	4.4.3 Deletion 4.4.4 Modification 4.4.5 Sorting 4.5 Multidimensional Array Unit : 5 : Character Array & String 5.1 Declaration & Initialization of String 5.2 Input/Output functions for String 5.3 Arithmetic operations on String 5.4 In built Functions for handling String 5.5 Array of String
Reference Book	1. Programming in ANSI C : E. Balagurusamy - Tata McGraw Hill 2. Let us C : Yashwant Kanetkar - BPB Publications 3. Programming with C : R S Bichkar - Universities Press 4. The complete Reference C : Herbert Schildt - McGrawHill 5. Schaums outline of Theory and Problems of programming with C : Byron Gottfried - McGrawHill 6. C Programming Language : Kernighan & Ritchie - TMH
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 105 : Internet and Web Technology

Course Code	105
Course Title	Internet and Web Technology
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To Provide basic knowledge about Internet and Web Designing.
Course Objective	To make the students aware of Internet and website designing using HTML, CSS and CSS Framework
Pre-requisite	NIL
Course Out come	Students will be able to understand the basics of Internet and develop static websites
Course Content	Unit : 1 : Introduction to Internet 1.1 History of Internet 1.2 Working of Internet 1.3 Internet Applications 1.4 Advantages of Internet 1.5 WWW 1.6 Uniform Resource Locator 1.7 W3C Standards 1.8 Web Pages 1.9 Web Server 1.10 Web Browsers 1.11 Domain Name Service 1.12 Applications of Internet 1.13 Internet Service Providers 1.14 DSL, Broadband and ISDN 1.15 Dedicated Connections 1.16 Wireless Connections 1.17 IP Addresses - IPv4 and IPv6 1.18 DHCP 1.19 Static IP and Dynamic IP Unit : 2 : HTML 2.1 Structure 2.2 Open Source HTML Editors 2.3 Links 2.4 Images and ImageMaps 2.5 Tables 2.6 Forms 2.7 Frames Unit : 3 : Advanced HTML 3.1 Semantic Elements and Non-Semantic Elements 3.2 HTML5 Elements 3.3 HTML5 Input Types and Attributes 3.4 Graphics - Canvas and SVG 3.5 Media - audio, embed, source, track and video Unit : 4 : Advanced Cascading Style Sheet (CSS) 4.1 Style Sheet Types 4.1.1 Linked 4.1.2 Embedded

	4.1.3 Inline 4.2 Style Sheet Precedence 4.3 Style Sheet Syntax 4.4 Using Classes 4.5 Font Control 4.6 Text Control 4.7 Color and Background 4.8 List Box Control 4.9 Miscellaneous Properties 4.9.1 Margin and Padding Properties 4.9.2 Border Properties 4.9.3 Tables 4.10 Multi-Column Layouts 4.11 Gradients 4.12 Drop Shadows 4.13 2D Transforms 4.13.1 Translate 4.13.2 rotate 4.13.3 scale 4.13.4 skew 4.14 3D Transforms 4.15 Transitions 4.16 Animations 4.17 Paged Media 4.18 Using Ready made Templates 4.19 Bootstrap framework 4.19.1 Introduction to Responsive Design, Using Bootstrap in a Web page 4.19.2 Typography, Color management, Jumbotron, Images, Alerts, Buttons 4.19.3 Tables, Forms, Drop downs, Navigation bar, Grid Basics, Pagination 4.19.4 Testing responsiveness using Browser Developer Tools Unit : 5 : Web Designing Fundamentals 5.1 Role and Tasks of a Web Designer 5.2 Characteristics of User Friendly Websites with Improved UI/UX 5.3 Basic Search Engine Optimization (SEO) Techniques 5.4 Case Study
Reference Book	1. How the Internet Works : Preston Gralla - Que PUB. 2. HTML 5.0 Black Book : Kogent - Dreamtech Press 3. HTML & CSS: The Complete Reference : Thomas - TMH 4. The Book of CSS3 - A Developer's Guide to the Future of Web Design : Peter Gasston - No Starch Press 5. The Internet : K.L. James - PHI 6. Internet Technology and Web Design : ISRD Group - TMH 7. Bootstrap: Jake Spurlock - O'Relly 8. Search Engine Optimization: Harold Davis - O'Relly
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 106 : Practical 1

Course Code	106
Course Title	Practical 1
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2021
Purpose of Course	To impart practical knowledge of programming
Course Objective	To give practical knowledge of C programming
Prerequisite	Nil
Course Outcome	Students will be able to solve problems using C language
Course Content	Practical based on Paper No. 104 - Fundamentals of Programming using C-I
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course : 107 : Practical 2

Course Code	107
Course Title	Practical 2
Credit	2
Teaching Per Week	4 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2021
Purpose of Course	To impart practical knowledge of static website development
Course Objective	To give practical knowledge of HTML
Prerequisite	Nil
Course Outcome	Students will be able to develop static website using HTML
Course Content	Practical based on 105 - Internet and Web Technology
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course: 203 : Fundamentals of Programming using C - II

Course Code	203
Course Title	Fundamentals of Programming using C - II
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To teach advance concepts of C language
Course Objective	To develop better understanding of advanced features of C programming language.
Pre-requisite	Basic knowledge of problem solving and C programming.
Course Outcome	Students will be able to write programs using advanced programming concepts using C language.
Course Content	Unit : 1 : Structure and Union 1.1 Structure 1.1.1 Declaring and Defining Structure elements 1.1.2 Structure Initialization 1.1.3 Structure assignment 1.1.4 Array of Structure, Array within a structure 1.1.5 Nested Structure 1.1.6 Size of Structure 1.2 Union Unit : 2 : User Defined Functions 2.1 Introduction 2.2 Declaration and Definition 2.3 Methods of parameter passing 2.4 Scope of variables and storage classes 2.5 Recursion 2.6 Passing array to functions 2.7 Passing Structure, union to function Unit : 3 : Pointer 3.1 Pointer Basics 3.2 Pointers and arrays 3.3 Chain of pointers 3.4 Pointer and character strings 3.5 Array of pointers, pointer to array 3.6 Pointer and functions 3.6.1 Call by value & call by reference 3.6.2 Passing array to a function using pointer 3.7 Pointer to structures 3.8 Issues with pointers 3.9 Dynamic memory allocation 3.9.1 Allocating a memory block 3.9.2 Allocating multiple blocks of memory 3.9.3 Altering the size of a block 3.9.4 Releasing used Space Unit : 4 : File Management in C 4.1 Introduction : Definition, File structure, concept of Record 4.2 File access modes: Sequential, random, binary, 4.3 File Operations 4.2.1 Creating a new file 4.2.2 Opening a file 4.2.3 Reading from a file 4.2.4 Writing to a file

	4.2.5 Moving to a specific location in a file (Seek) 4.2.6 Closing a file 4.4 Error handling during I/O operations 4.5 Command Line Arguments Unit : 5 : The Pre-processor 5.1 Features of C Preprocessor 5.2 Macro 5.3.1 Macro Expansion 5.3.2 Macro with arguments 5.3.3 Nested Macro 5.3 File Inclusion 5.4 Conditional compilation 5.5 Compiler Control Directives
Reference Book	1 Programming in ANSI C : E. Balagurusamy - Tata McGraw Hill 2 Let us C : Yashwant Kanetkar - BPB Publications 3 Pointers in C : Yashwant Kanetkar - BPB 4 The complete Reference C : Herbert Schildt - McGrawHill 5 Programming with C : R S Bichkar - Universities Press 6 C Programming Language : Karnighan & Ritchie - TMH 7 Mastering Turbo C : Stan Kelly - BPB
Teaching Methodology	Discussion, Independent Study, Seminars and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 204 : E Business and Cyber Laws

Course Code	204
Course Title	E Business and Cyber Laws
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	March 2021
Purpose of Course	To provide fundamental knowledge of E Business and Cyber Laws
Course Objective	To Impart fundamental Knowledge of E Business and Cyber Laws
Pre-requisite	Knowledge of Fundamental of Computers, Computer Networks
Course Out come	Students will be able to understand E Business , Cryptocurrency, Blockchain, Cyber Security and Cyber Laws
Course Content	Unit 1 : E Commerce 1.1 E Business 1.2 E Business Models 1.3 The Technologies and Infrastructural requirements of E-Commerce 1.4 Advantages and Disadvantages of E-Commerce 1.5 International issues of Electronic Commerce 1.6 Types of business transactions (B2B), (B2C), (B2G), Business Processes 1.7 Digital India Services, DigiLocker and other tools Unit 2 : Introduction to E Payments 2.1 Digital payments requirements 2.2 Digital Token based E payment systems 2.3 Classification of new payment system 2.4 E Wallet 2.5 Online Internet Banking 2.6 Unified payment Interface – BHIM and other tools 2.7 Online financial services in India Unit 3 : Cryptocurrency ,Bitcoin and Blockchain 3.1 Introduction to Cryptocurrency 3.2 How Cryptocurrency Works , Ewallet Services and Personal Cryptosecurity 3.3 Introduction to Bitcoin , Merchants acceptance of Bitcoin 3.4 How Bitcoin Works overview, Transaction ,Blocks , Mining 3.5 Blockchain – Technology Stack :Protocol, Currency 3.6 Financial Services 3.7 Crowd Funding 3.8 Bitcoin Prediction Markets, 3.9 Smart Property 3.10 Smart Contracts 3.11 Decentralized Governance Services. 3.12 The Blockchain is an Information Technology Unit 4 : Cyber Security 4.1 Introduction 4.2 Network and website Security Risks 4.3 Hacking 4.4 Privacy Risk 4.5 Cyber Defamation 4.6 Identity Theft & Fraud

	4.7 Digital Forgery 4.8 Cyber terrorism 4.9 Cyber Pornography 4.10 Digital Forgery 4.11 Digital Signature 4.12 E- business Risk management issues 4.13 Firewall, Security framework Unit 5 : Cyber Laws 5.1 Cyber Crimes against Individuals, Institution and State 5.2 Computer and mobile as target for crime 5.3 Introduction to Cyber Laws 5.4 Limitation of India's Cyber Laws 5.5 Types of Civil Wrongs under the IT Act, 2000 5.6 Punishments under the IT Act 5.7 Intellectual Property Rights
Reference Book	1. E-Commerce An Indian Perspective P.T. Joseph ,S. J. - PHI publication 2. IT Encyclopedia.Com : Parag Diwan & Sunil Sharma - E-commerce - Pentagon Press. 3. E-Commerce Strategies : Charles Trepper – PHI 4. Information Technology Act : S. R. Bhansali - University Book House Pvt. Ltd. 5. Cyber Crimes and Law Enforcement : Vasu Deva - Commonwealth Publishers 6. Decentralized Applications , Harnessing Bitcoin's Blockchain Technology: Siraj Raval – O'Reilly 7. Blockchain, Blueprint for a new Economy : Melanie Swan – O'Reilly 8. Mastering Bitcoin, Programming the open Blockchain : Andreas M. Antonopoulos – O'Reilly 9. Essential CyberSecurity Science : Josiah Dykstra – O'Reilly
Teaching Methodology	Class Room Teaching, Discussion and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 205 : Introduction to DBMS

Course Code	205
Course Title	Introduction to DBMS
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)
Last Review / Revision	June 2021
Purpose of Course	To introduce the basic concepts of database management system that includes data models, database design and basic practical of open source DBMS.
Course Objective	To teach fundamental concepts of DBMS including data models, ER diagram, different types of databases. This course also entails practical aspect of open source database.
Pre-requisite	Fundamentals of Computer, Programming Language
Course Out come	Students will be able to understand and implement basic database design principles, learn overview of different types of database. Students will also be able to perform practical on database through source database.
Course Content	Unit : 1 : Basic Concepts of DBMS 1.1 File Organization and Traditional File based System 1.2 Database and Need for DBMS 1.3 Characteristics of DBMS 1.4 Applications of DBMS 1.5 Views of Data - Schema and instances 1.6 Data Independence 1.7 Database Languages 1.8 Transaction Management 1.9 ACID Properties of Transaction 1.10 Database Administrator and Database Users 1.11 Overall System Architecture Unit : 2 : Data Models 2.1 Data Models 2.1.1 Network Model 2.1.2 Hierarchical Model 2.1.3 Relational Model 2.1.4 Object Model 2.1.5 Object-Relational Model 2.2 Entity Relationship Model 2.2.1 DB Design using ER Model 2.2.2 Entities 2.2.3 Relationships 2.2.4 Attributes 2.2.5 Entities and Relationship Set 2.2.6 Constraints and Design Issues 2.2.7 Weak Entity Set 2.2.8 Cardinality Ratio Unit : 3 : Types of Databases and Recent Trends in DBMS 3.1 Types of Databases 3.1.1 Object Oriented Database 3.1.2 Centralized Database

	3.1.3 Distributed Database 3.1.4 Parallel Database 3.1.5 Multimedia Database 3.1.6 NoSQL Database 3.1.7 Temporal Database 3.1.8 XML Database 3.2 Recent Trends in DBMS 3.2.1 Overview of Various Databases - MySQL, PostgreSQL, SQLite, MongoDB, MariaDB, Oracle, DB2 and SQL Server 3.3 Big Data Unit : 4 : Introduction to Open Source Database - MySQL 4.1 Getting Started with MySQL 4.2 Installing MySQL 4.3 Data Types 4.4 Creating and Using Database 4.5 DDL Statements 4.5.1 Create Table 4.5.1.1 Constraints 4.5.1.2 Primary Key and Foreign Key Constraint 4.5.2 Alter Table 4.5.3 Delete Table Unit : 5 : DML Statements and Other Functions of MySQL 5.1 DML Statements 5.1.1 Insert Statement 5.1.2 SQL 5.1.3 Select Statement 5.1.4 Update Statement 5.1.5 Delete Statement 5.2 Aggregate Functions 5.3 Numerical Functions 5.4 String and Character Functions
Reference Book	1. Database System Concepts : Silberschatz, Korth and Sudarshan - McGraw Hill 2. An introduction to database systems : C. J. Date - Addison Welsley 3. Fundamentals of Database Systems : Elamsri, Navathe, Somayajulu and Gupta - Pearson Education 4. PHP and MySQL Web Development (Developer's Library) : Luke Welling - Addison - Wesley Professional 5. The Complete Reference MySQL : Vikram Vaswani - McGraw Hill 6. Murach's MySQL : Joel Murach - Mike Murach & Associates, Inc.
Teaching Methodology	Lectures, Discussion, Independent Study, Seminars, Case Study and Assignment
Evaluation Method	30% Internal assessment 70% External assessment

Course : 206 : Practical 3

Course Code	206
Course Title	Practical 3
Credit	3
Teaching Per Week	6 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Last Review/Revision	June 2021
Purpose of Course	To impart practical knowledge of advance features of programming
Course Objective	To give practical knowledge of advance C programming
Prerequisite	Basic knowledge of C programming language
Course Outcome	Students will be able to solve problems using advance features of C language
Course Content	Practical based on Paper No 203 - Fundamentals of Programming using C-II
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Course : 207 : Practical 4

Course Code	207
Course Title	Practical 4
Credit	2
Teaching Per Week	4 Hrs
Minimum Weeks Per Semester	15 (Including Practical Work, Examination, Preparation, Holidays etc.)
Review/Revision	June 2021
Purpose of Course	The course provides practical knowledge of open source database – MySQL.
Course Objective	The course prepares students to execute basic database statements using MySQL.
Prerequisite	Basic Programming Concepts
Course Outcome	After completion of this course, students will be able to perform basic DDL, DML commands including SQL queries using MySQL.
Course Content	Practical based on Paper No. 205 - Introduction to DBMS
Reference Books	NIL
Teaching Methodology	Lab Work
Evaluation Method	30% Internal Assessment 70% External Assessment

Master of Science (Information Technology)

Name of Program		Master of Science (Information Technology)						
Abbreviation		M.Sc. (I.T.)						
Duration		5 Years Integrated Course B.Sc.(I. T.) – 3 years – Semester 1 to 6 M.Sc.(I. T.) – 2 years – Semester 7 to 10						
Eligibility		H S C / Equivalent Examination from Science Stream (A / B / AB Group) or Vocational Stream or General Stream (Commerce) with English as one of the subject.						
Objective of Program		The objective of the program is to transform students into professionals by indoctrinating advanced technical knowledge, enhancing technical skills, communication skills and provide outstanding placement in reputed I.T. companies.						
Program Outcome		After the completion of the course, students will be able to develop and manage various types of software based on technologies learnt throughout the course and emerging technologies in IT industry which will give them excellent career prospects.						
Effective From		June 2021						
Program Structure			B.Sc. (I.T.) – Semester 1 (M.Sc. (I.T.) 5 years Integrated Course)					
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
101	Communication Skills in English	4	0	4	3 Hrs	70	30	100
102	Mathematics – I	4	0	4	3 Hrs	70	30	100
103	Fundamentals of Computer	4	0	4	3 Hrs	70	30	100
104	Fundamentals of Programming using C- I	4	0	4	3 Hrs	70	30	100
105	Internet and Web Technologies	4	0	4	3 Hrs	70	30	100
106	Practical 1	0	6	3	2 Hrs	70	30	100
107	Practical 2	0	4	2	2 Hrs	70	30	100
108	NSS/Sports/Saptdhara	-	-	2	-	-	-	-
	Total	20	10	27	-	490	210	700
Program Structure			B.Sc. (I.T.) – Semester 2 (M.Sc. (I.T.) 5 years Integrated Course)					
Course Code	Title	Teaching per week (Hrs.)		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
201	Business Communication Skills in English	4	0	4	3 Hrs	70	30	100
202	Mathematics- II	4	0	4	3 Hrs	70	30	100
203	Fundamentals of Programming using C- II	4	0	4	3 Hrs	70	30	100
204	E Business and Cyber Laws	4	0	4	3 Hrs	70	30	100
205	Introduction to DBMS	4	0	4	3 Hrs	70	30	100
206	Practical 3	0	6	3	2 Hrs	70	30	100
207	Practical 4	0	4	2	2 Hrs	70	30	100
208	NSS/Sports/Saptdhara	-	-	2	-	-	-	-
	Total	20	10	27	-	490	210	700
Program Passing Rules			As per University rules					

VEER NARMAD SOUTH GUJARAT UNIVERSITY



KANU BHARWAD

Senate Member, VNSGU - SURAT

Member, Akhil Bharatiya Vidyarthi Parishad

+91 99254 70234

વી. ન. દ. ગુ. યુનિ. સુરત

આવક નં.....૧૪૧૦.....

તારીખ.....(૪-૬-૨૧)

તા.૧૫-૦૫-૨૦૨૧

(૨)
15/05/2021

P.G
21/05/21

પ્રતિ,

આદરણીય કુલપતિશ્રી,

વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,

યુનિવર્સિટી કેમ્પસ, ઉધના મગદલ્લા રોડ,

સુરત-૩૯૫૦૦૭

વિષય : M.Phil./Ph.D. ની થીસીસ ચકાસણી માટે ઓનલાઈન મોકલવા બાબત...

માનનીય સાહેબશ્રી,

ઉપરોક્ત વિષયના સંદર્ભમાં સવિનય જણાવવાનું કે, યુનિવર્સિટીમાં M.Phil./Ph.D. કરતાં વિદ્યાર્થીઓ સંશોધનના અંતે થીસીસ યુનિવર્સિટીમાં જમા કરાવતા હોઈ છે. આ સંશોધનની ચકાસણી યુનિવર્સિટી દ્વારા નિયુક્ત બહારના પીએચ.ડી. સુપરવાઈઝર પ્રોફેસરો કરતા હોય છે. જેનો પ્રથમ સીનોપસીસ અને ત્યારબાદ થીસીસ મોકલ્યા બાદ રિપોર્ટ માટે ખુબ સમય જાય છે. ત્યારબાદ વિદ્યાર્થીને વાચવા માટે બોલાવવામાં આવે છે. હાલમાં અમલ થતી આ પ્રક્રિયા વધારે સમય લે છે અને ઘણી વાર નિયત પત્ર વ્યવહાર અથવા અન્ય કોઈ અડચણને કારણે નિયત સમયમાં પુરી થતી નથી. જેથી વિદ્યાર્થીઓને ડિગ્રી મેળવવા રાહ જોવી પડે છે.

આ બાબતે યોગ્ય માળખું બનાવી ડીજિટલ માધ્યમનો ઉપયોગ કરી સમગ્ર પ્રક્રિયા કરવામાં આવે તો સમયનો બચાવ કરી શકાય. આ ઉપરાંત સમગ્ર પ્રક્રિયાની સમયમર્યાદા પણ નક્કી કરવામાં આવે જેથી વિદ્યાર્થીને યોગ્ય સમયમાં સંશોધન કાર્યની સ્વીકૃતિ મળી શકે. સાથે જ પર્યાવરણ જાળવણીની દિશામાં એક નાનકડો પ્રયાસ કરી શકાય.

સહકારની અપેક્ષા સહ.

લિ.

આપનો વિશ્વાસુ,

કનુ ભરવાડ.

કનુ ભરવાડ.