



TAMIL NADU GOVERNMENT GAZETTE

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Part II—Section 2

Notifications or Orders of interest to a Section of the public
issued by Secretariat Departments.

NOTIFICATIONS BY GOVERNMENT

HIGHER EDUCATION DEPARTMENT

Implementation of Chief Minister Research Fellowship Scheme for the students of Government Arts and Science Colleges - Prescription of syllabus for conducting the qualifying examination for Chief Minister Research Fellowship Scheme 2023-24.

[G.O.Ms.No. 276, Higher Education (G1), 20th November 2023,
கார்த்திகை 4, சோபகிருது, திருவள்ளுவர் ஆண்டு-2054.]

No. II(2)/HE/1048(a)/2023.

CMRF

தமிழ் Code: A01

அலகு : 1

பழந்தமிழ் இலக்கியங்கள்

- எட்டுத்தொகை, பத்துப்பாட்டு நூல்கள்.
- பதினெண்கீழ்க்கணக்கு நூல்கள்.

இவை குறித்துப் பொதுநிலை இலக்கிய வரலாறுத் தரவுகள் காலம், தொகுப்பு முறை , ஆசிரியர் வரலாறு, முதன்மையான பாடுபொருள், அவற்றிற்கு உரையெழுதியோர், அவர்கள் முன்வைத்துள்ள பொதுக் குறிப்புகள் போன்றன கவனம் பெறும்.

காப்பியங்கள்

- பெருங்காப்பியங்கள், சிறுகாப்பியங்கள்
- பிற்காலக்காப்பியங்கள் - கம்பராமாயணம், பெரியபுராணம், திருவிளையாடற்புராணம், வில்லிபாரதம், பெருங்கதை , நளவேண்பா, தேம்பாவணி, இரட்சணியயாத்திரிகம், சீறாப்புராணம் , இயேசுகாவியம், நாயகம் ஒரு காவியம், இராவண காவியம்.

அலகு : 2

பக்தி இலக்கியங்கள், சிற்றிலக்கியங்கள், தனிப்பாடல்கள், உரையாசிரியர்கள்

- பன்னிரு திருமுறைகள்
- நாலாயிர திவ்வியபிரபந்தம்
- சித்தர் பாடல்கள், அருணகிரிநாதர், தாயுமானவர் , வள்ளலார்
- குணங்குடி மஸ்தான் சாகிபு
- சிற்றிலக்கிய வகைகள்
- தனிப்பாடல் திரட்டு

• **இலக்கிய உரையாசிரியர்கள்** : அடியார்க்கு நல்லார், நச்சினார்க்கினியர், திருக்குறள் பழைய உரையாசிரியர்கள், நாதமுனி, சிவஞானமுனிவர், பண்டிதமணி, கதிரேசனார், ஓனவை சு. துரைசாமிப்பிள்ளை, பெருமழைப்புலவர் பொ. வே. சோமசுந்தரனார், பின்னத்தூர் நாராயணசாமி, அய்யங்கார், வை. மு. கோபாலகிருஷ்ணாமாச்சார்யார், உ. வே. சாமிநாதய்யர், சி. வை தாமோதரம்பிள்ளை, புலவர் குழந்தை, சிவக்கவிமணி சுப்ரமணிய முதலியார். கவி. கா. மு. ஷெரீப்

இக்கால இலக்கியங்கள்

தேசிய இயக்கப்பின்னணியில் பாரதியார், கவிமணி தேசிகவிநாயகம்பிள்ளை, நாமக்கல் வெ. இராமலிங்கம்பிள்ளை , சுத்தானந்த பாரதியார், திராவிட இயக்கப் பின்னணியில் பாரதிதாசன், முடியரசன், சுரதா – பொதுவுடைமை நோக்கில் தமிழ் ஒளி, தணிகைச் செல்வன், பரிணாமன்.

திரைப்படப் பாடலாசிரியர்கள் : பாபநாசம் சிவம், பட்டுக்கோட்டை கல்யாணசுந்தரம், உடுமலை நாராயணகவி, கவி. கா. மு. ஷெரீப், கண்ணதாசன், மருதகாசி, வாலி, வைரமுத்து, அறிவுமதி, நா. முத்துக்குமார், பா. விஜய், தாமரை.

அகவயத் தேடலைக் கவிதைகளாக்கிய போக்கு : ந. பிச்சமுர்த்தி, மயன், பசுவய்யா, அபி, அப்துல் ரகுமான், ஞானக்கூத்தன், பிரமின், ஆத்மநாம், சுகுமாரன், தேவதேவன், தேவதச்சன், மனுஷ்யபுத்திரன். யவனிகா ஸ்ரீராம், என் . டி . ராஜ்குமார் – புறநிலையை விமர்சனப்போக்கு: நா. காமராசன், மு.மேத்தா , சிற்பி , மீரா , புவியரசு,தமிழன்பன், தமிழ்நாடன், இன்குலாப், ஹெச்.ஜி. ரஞ்சல் – மண்சார் கவிதைகள்: பழமலம், காலப்ரியா, கல்யாண்ஜி, தமிழ்ச்சி தங்கபாண்டியன் – பெண்ணிய வெளிப்படுத்தல்கள்: இரா. மீனாட்சி, வைகைச்செல்வி, சல்மா, கனிமொழி, உமா மஹேஸ்வரி, சுகிர்தராணி, சக்திஜோதி, இளம்பிறை, புதிய மாதவி.

ஹைகூ.,சென்ட்ரியூ, லிமரிக், லிமரைக்கூ., கஜல், போன்சாய் கவிதைகள்.

சிறுகதைகள்: வ.வே. சு. அய்யர், புதுமைப்பித்தன், மௌனி, லா. ச. ராமாமருதம், பி. எஸ். ராமையா கு.அழகிரிசாமி, வல்லிக்கண்ணன், கு.பி.ராஜகோபாலன், விந்தன், அகிலன், வண்ணதாசன், ஆஸ்வகோஷ், ஜெயந்தன், மா. அரங்கநாதன், அம்பை, ஆர். சூடாமணி, கந்தர்வன், தமிழ்ச்செல்வன், பா.செயற்காசம், பாவண்ணன், கோணங்கி, ஆகியோர் படைப்புகள்.

புதினங்கள்: மாயூரம் வேதநாயகம் பிள்ளை, இராஜம் அய்யர், அ.மாதவையா ,கல்கி, மு.வரதராசன், க.நா.சுப்பிரமணியன், ஆர். சண்முகசுந்தரம், ஜெயகாந்தன், தி.ஜானகிராமன், கி.ராஜநாராயணன், சா. கந்தசாமி, சுந்தரராமசாமி, அசோகமித்திரன், ராஜம் கிருஷ்ணன், இந்திராபார்த்தசாரதி, ஆதவன், நீல. பத்மநாபன், எம்.வி. வெங்கடராம், நாஞ்சில் நாடன், தோப்பில் முகம்மதுமீரான், திலகவதி, பிரபஞ்சன், பூமணி, பொன்னீலன், சு.சமுத்திரம், டி.செல்வராஜ், வண்ணநிலவன், மேலாண்மை பொன்னுசாமி, சிவகாமி, இமையம், தஞ்சைப்ரகாஷ், கீரணூர் ஜாகீர்ராஜா, ஜெயமோகன், எஸ்.ராமகிருஷ்ணன், சாருநிவேதிதா, பாமா, சோ.தர்மன், ஜோ.டி. குருஸ், ஆகியோர் படைப்புகள்- சாகித்திய அகாடெமி, யுவபுரஸ்கார் விருதுகள் பெற்ற எழுத்தாளர்களின் படைப்புகள்.

நாடகங்கள் – மனோன்மணியம் சுந்தரம்பிள்ளை, சங்கரதாஸ் சுவாமிகள், பம்மல் சம்பந்த முதலியார், சி.என். அண்ணாதுரை, கலைஞர் மு.கருணாநிதி, பி.எஸ். ராமையா, ஆர்.எஸ்.மனோகர், சோ.ராமசாமி, கோமல் சுவாமிநாதன், மெரினா, அறந்தை நாராயணன், சுஜாதா. நவீனத்துவ நாடகப் பிரதிகள் : இந்திரா பார்த்தசாரதி, ஜெயந்தன், நவீன நாடக இயக்கங்கள்: கூத்துப்பட்டறை ந.முத்துசாமி, நிஜநாடக இயக்கம் மு.ராமசுவாமி, பரிஷாடாநி – சபாநாடகங்கள்- நாட்டார் கலைகளும் நவீன நாடக உருவாக்கமும் – சே.ராமானுஜம், இரா.இராக, கே.ஏ.குணசேகரன், கருஞ்சுழி ஆறுமுகம், வேலு. சரவணன், ச. முருகபூபதி.

அயலகத் தமிழ் இலக்கியங்கள் – இலங்கை, மலேசியா, சிங்கப்பூர், புலம்பெயர்வு படைப்பாளர்களும் படைப்புகளும் உரைநடை வளர்ச்சியின் வகைகள், ஆளுமைகள் : மறைமலை அடிகள், திரு.வி.க., மயிலை சீனி. வேங்கடசாமி, ரா.பி. சேதுப்பிள்ளை, வெ.சாமிநாத சர்மா, ஈ.வெ.ரா.

தன் வரலாறுகள்: வ.உ.சி. உ.வே.சா., திரு.வி.க., நாமக்கல் கவிஞர், நெ.து. சுந்தரவடிவேலு, கலைஞர் மு.கருணாநிதி, அப்துல் கலாம்.

பயண இலக்கியங்கள்: ஏ.கே.செட்டியார், சோமலெ, மீ.ப.சோமு, சி.சுப்பிரமணியம், மணியன்.

வாழ்க்கை வரலாறுகள் : வ.ரா. எழுதிய பாரதியார், தொ.மு.சி. ரகுநாதன் எழுதிய புதுமைப்பித்தன் வரலாறு, சுந்தா எழுதிய பொன்னியின் செல்வன், சிற்பியெழுதிய இராமானுசர் வரலாறு, பொன்னீலன் எழுதிய குன்றக்குடி அடிகளார்.

கடித இலக்கியங்கள்: மறைமலை அடிகள், வ.சுப.மாணிக்கம், சி.என். அண்ணாதுரை, மொழி பெயர்ப்புகள்: தமிழுக்கு மொழி பெயர்த்தவர்கள்— ஆண்ட்ரிக் ஆண்ட்ரில், சுத்தானந்தபாரதி, காஸ்ரீ.ஸ்ரீ., த.நா, குமாரசாமி, த.நா.சேனாதிபதி, சி.ஏ.பாலன், சரஸ்வதி ராம்நாத், தி.ப.சித்திலங்கையா, அ.அ.மணவாளன், பி.எஸ். எஸ். சாஸ்திரி, மு.கு.ஜகந்நாதராஜா, நா.தர்மராஜ், நெல்லை வேலாயுதம், எத்திராஜாலு, வெ. ஸ்ரீராம், மணவை முஸ்தபா, தியாகு, பாவண்ணன், இந்திரன், ஆனந்தகுமார், சிற்பி, சுகுமாரன், புவியரசு,ரவிக்குமார், குளச்சல் யூசுப், சா.தேவதாஸ், எம்.எ. சசிலா, ஜி.குப்புசாமி, அகிலன் எத்திராஜ்.

தமிழிலிருந்து பிறமொழிகளுக்கு : ஏ.கே.ராமானுஜன், கா.செல்லப்பன், கபில் சுவலபில், ம.லெ. தங்கப்பா. அ.தட்சிணாமூர்த்தி, ஜார்ஜ் எல்.ஹார்ட், லட்சுமிஹோம்ஸ்ட்ராம், ப.மருதநாயகம், வைதேகி ஹெர்பர்ட். கே.எஸ். சுப்பிரமணியன், சரஸ்வதிராம்நாத், நாகரத்தினம் கிருஷ்ணா, க.வாசுதேவன்.

அலகு: 3

இலக்கணங்கள் :

எழுத்திலக்கணமும் கோட்பாடுகளும் – தொல்காப்பியம், நன்னூல், சொல்லிலக்கணமும் கோட்பாடுகளும் – தொல்காப்பியம், நன்னூல், பொருள் இலக்கணமும் கோட்பாடுகளும் – அகம்: (தொல்காப்பியம், இறையனார் களவியல், நம்பியகப்பொருள்) புறம்: (தொல்காப்பியம்— புறத்திணையியல், புறப்பொருள் வெண்பாமாலை) யாப்பிலக்கணமும் கோட்பாடும் – தொல்காப்பியச் செய்யுளியல், யாப்பருங்கலக்காரிகை அணி இலக்கணமும் கோட்பாடும் – தொல்காப்பிய உவமையியல், தண்டியலங்காரம் பாட்டியல் இலக்கணம் – பன்னிருபாட்டியல், சிதம்பரப்பாட்டியல், வெண்பாப்பாட்டியல், பிரபந்ததீபிகை, பிரபந்தமரபியல்.

இலக்கண உரையாசிரியர்கள்,மொழி வரலாறு,நோக்கு நூல்கள்.

• இலக்கண உரையாசிரியர்கள்: இளம்பூரணர், நச்சினார்க்கினியர்,சேனாவரையர், பேராசிரியர், தெய்வச்சிலையார், கல்லாடர், மயிலைநாதர்,சிவஞான முனிவர் , ஆறுமுகநாவலர், சங்கரநமச்சிவாயர், விசாகப்பெருமாள் அய்யர், க.வெள்ளைவாரணர், ஆ.சிவலிங்கனார், பாவலேரேறு ச.பாலசுந்தரனார்.

• மொழியியல் பார்வையோடு எழுதப்பெற்றுள்ள மொழி வரலாறு மற்றும் இலக்கண நூல்கள் :ராபர்ட் கால்டுவெல், தெ.பொ.மீனாட்சிசுந்தரன், வ.அய்யர்.சுப்பிரமணியன், ச.அகத்தியலிங்கம், கு.பரமசிவம், முத்துச்சண்முகன், எம்.ஏ.நுஃமான், செ.வை.சண்முகம், பொற்கோ.

• நிகண்டுகள் – அகராதிகள், சொற்களஞ்சியங்கள், பொருட்களஞ்சியங்கள், அடைவுகள் (சொல்,பொருள்,தொடர்)

அலகு 4

இலக்கியத்திறனாய்வு

• இலக்கியக்கலை, இலக்கியத்திறன்,இலக்கியமரபு, இலக்கியத் திறனாய்வியல், திறனாய்வுக்கலை, இலக்கியக்கொள்கைகள், ஒப்பிலக்கியக்கொள்கைகள் போன்றவற்றை அறிமுகம் செய்த நூல்கள்.

• திறனாய்வு முறைகள்: ரசனை முறை, மதிப்பீட்டுமுறை, அழகியல் முறை, விளக்கமுறை, பகுப்புமுறை, வரலாற்று முறை, உருவவியல், மனப்பதிவுமுறை,

• இலக்கிய இயக்கங்கள்: செவ்வியல்வாதம், புனைவியல்வாதம், இயற்பண்பியல்வாதம், நடப்பியல் வாதம்—நடப்பியல் அல்லாத இலக்கிய இயக்கங்கள் : இருத்தலியல், குறியீட்டியல், மிகைதார்த்தவியல், படிமவியல், வெளிப்பாட்டியல், மனப்பதிவியல், குருரவியல் ஆகியன.

• திறனாய்வு அணுகுமுறைகள்: சமுதாயவியல், மார்க்சியவியல், உளவியல், தொல்படிமவியல், மானிடவியல், உருவவியல், இனவரைவியல், அமைப்பியல், தலித்தியம், பெண்ணியம் ஆகியவற்றின், அடிப்படைகள்.

• கல்விப்புல ஆய்வு முறையியல் சார்ந்த இலக்கியத்திறனாய்வாளர்கள்:

ஆ. முத்துசிவன், எஸ்.வையாபுரிபிள்ளை, தெ.பொ.மீனாட்சி சுந்தரன், அ.ச.ஞானசம்பந்தன், மு.வரதராசன், வ.சுப.மாணிக்கம், க.ப. அறுவாணன், தா.வே.வீராசாமி, ச.வேசுப்ரமணியன், எழில் முதல்வன், தமிழிண்ணல், பெ.மாதையன், குளோரியா சுந்தரமதி.

• கல்விப்புல ஆய்வு முறையில்சாரா இலக்கியத் திறனாய்வாளர்கள்: வ.வே.சு.அய்யர், டி.கே.சி.,க.நா.சுப்ரமணியன், தொ.மு.சி.ரகுநாதன், சி.சு.செல்லப்பா, வெங்கட்சாமினாதன், நா.வானமாமலை, கோவைஞானி, அ.மார்க்ஸ், தமிழவன், கோ.கேசவன், ராஜ்கௌதமன், ரவிக்குமார், தி.சு, நடராசன், க.கைலாசபதி, கா.சிவத்தம்பி, எம்.எஸ்.மான்சி. கனகசாபாதி, க.பஞ்சாங்கம்

தமிழக வரலாறு

• தமிழகத்தின் வரலாற்றையும் பண்பாட்டையும் எழுதுவதற்குப் பயன்படும் அடிப்படை நூல்களையும் தரவுகளையும் அறிவது - தமிழ்நாட்டுப்பாட நூல் நிறுவனம் வெளியிட்டுள்ள நூல்கள் அடிப்படை நூல்களாக அமையும். கே.கே பிள்ளை தமிழக வரலாறும்பண்பாடும், க. சுப்பிரமணியன், ந. சுப்பிரமணியன் ஆகியோரின் சங்ககால வரலாறுகள், மா.இராசமாணிக்கனார் - பல்லவர் வரலாறு, தி.வை. சதாசிவபண்டாரத்தார், பி. நீலகண்டசாஸ்திரி, ஆகியோரின் சோழர் கால வரலாறு.சங்ககாலம் தொடங்கிச் சமகாலம் வரையிலான தமிழக வரலாற்றுப் பொதுப்பார்வை.

அலகு 5

தமிழகப்பண்பாடு

- தொல்லியல், நாணயவியல், கல்வெட்டியல், தமிழர் இசை, கட்டடக்கலை, சுவடியியல்,
- நாட்டுப்புறவியல் - பாடல்கள், கதைகள், கதைபாடல்கள், சடங்குகள் - நாட்டார் நடனங்கள், நாடகங்கள் - வழிபாடுகள், திருவிழாக்கள், பெருங்கோயில் பண்பாடு, நகரம் சார் பண்பாடு, உள்ளூர்ப்பண்பாடு , பண்பாட்டு நோக்கில் பண்டைய நகரங்களும் நவீன நகரங்களும் நாட்டுப்புற ஆய்வுகளும் ஆய்வாளர்களும் .
- செ.வைத்திலிங்கம் தமிழர் பண்பாட்டு வரலாறு - மயிலை சீனி வேங்கடசாமியின் தமிழர் வளர்த்த அழகுக்கலைகள் - அயல்நாட்டார் குறிப்புகள் .

தமிழும் பிறதிறைகளும்

- தமிழ் ஊடகங்கள் - நாளிதழ் மற்றும் பருவ இதழ்களான அச்ச ஊடகங்கள், மின் ஊடகங்கள், திரைப்படங்கள், வானொலி, தொலைக்காட்சி, கணினித்தமிழ்,
- இணையத்தமிழ் பயன்பாடு: இணைய வலைத்தளங்கள் , வலைப்பூக்கள், முகநூல், கட்செவி போன்றன - பேச்சுத்தமிழ் இலக்கணம், மேடைகளில் தமிழ்ப் பயன்பாடும் சிக்கல்களும்.
- பிற அறிவுத்துறைகளில் தமிழ் வளர்ச்சி.

CMRF

Subject:English

Code No: A02

Unit -I: British Literature prose and poetry , British Literature drama, fiction, and short story

Unit - II: American literature, New Literatures -- Canadian, Australian, New Zealand, African , Caribbean

Unit III: Literary forms, literary movements, Literary terms and concepts, Language and Linguistics – The English language - basic concepts, and theory, phonology, morphology, semantics, syntax, pragmatics; English language teaching - Approaches and methods, Technology in teaching English language.

Unit IV: Cultural Studies, Literary Criticism, Indian writing in English.

Unit V: Literary Theory post World War II, Research Methods and Materials in English

CMRF

SUBJECT: HISTORY

CODE NO. A03

SYLLABUS**Unit - I: Ancient Indian History**

Sources of Ancient Indian History: Archaeological Sources: Exploration, Excavation, Epigraphy, Numismatics, Monuments. Literary Sources: Indigenous: Primary and Secondary - Problem of Dating - Myths, Legends, etc. - Religious and Secular Literature - the Puranas and the Epics - Foreign accounts: Greek, Chinese and Arabs - Geographical Factors - Pre-Historic Age - Hunting and Gathering- Palaeolithic Age or Early Stone Age and Mesolithic Age - Mesolithic Culture - Neolithic Age - Beginning of Agriculture, the Age of Metals - Pastoralism and Food production: Chalcolithic Age [Generally, the Prehistoric Period categorized in three archaeological periods: the Stone Age, Bronze Age and Iron Age]. Indus Valley Civilisation: Introduction to Indus Valley Civilisation - Extent of the Civilisation - Main Cities of Indus Valley Civilization - Town Planning - Religion, Society and Polity - Decline of Indus Valley Civilisation - First urbanization in India - Megalithic Cultures - Megaliths of South India - Introduction of Iron Technology (Use of Iron in Agriculture) - Iron Age in India - Urban Occupations, Crafts and Pottery. Vedic Period: Migrations and Settlements - Original Home of the Aryans - Evolution of Social and Political Institutions - Four Stages of life (chaturashrama system): Economic Condition - Religious Condition - Vedic Gods and their Importance - The Later Vedic Age or The Epic Age - Political, Social, Economic and Religious Conditions - Philosophical Ideas, Rituals and Practices - Vedic Literature - Condition of India during the Epic Period - Development of Image-worship among the Aryans - Significance of the Vedic Age - Evolution of Monarchy and Varna System.

Unit – II: Expansion of State System

Formation of States (Mahajanapada): From State to Empire: Monarchies and Republics - Economic and Social Developments and Emergence of Second Urbanization in 6th century BCE:

Emergence of Heterodox sects- Jainism, Buddhism and Ajivikas - From State to Empire: Rise of Magadha and Foreign Invasions - Persian and Macedonian Invasions and their Impact - Greek invasion under Alexander and its effects - Mauryan Empire: Foundation of the Mauryan Empire - Chandragupta Maurya -Mauryan Polity, Society and Economy - Mauryan Art and Architecture - Ashoka - Kalinga War and its Impact - Concept of Asoka's Dhamma and its Nature - Asokan edicts - Brahmi and Kharoshthi Scripts - Arthashastra of Kautilya - Indian Society under the Mauryas - Downfall of the Mauryan Empire - Dissolution of Empire and Emergence of Regional Powers: Indo-Greeks, Sungas: Pushyamitra -Importance of the Sungas - Growth of Bhagavata Cult and Revival of Brahmanical Religion - Satavahanas, The Kushanas - Origin and Original Home of the Kushanas - Kanishka I - Contact with Outside World - Growth of Urban Centres - Economy - Crafts and Guilds - Coinage - Development of Religions - Bhagavatism and Saka-Ksatrapas - Sangam literature: Polity and Society in South India as reflected in Sangam literature - Trade and commerce from 2nd century BCE to 3rd century CE - Trade with the Roman World - Emergence of Mahayana Buddhism - Kharavela and Jainism - Post-Mauryan Art and Architecture - School of Art in Ancient India: Gandhara, Mathura and Amaravati Schools.

Gupta Vakataka age: Sources - Founders - Chandragupta I - Administration of Guptas - Bureaucracy of the Government - Council of Ministers - Agrarian Economy: Land Grants, Land Revenue and Land Rights - Coinage of the Guptas - Beginning of Temple Architecture - Emergence of Puranic Hinduism - Decline of Urban Centres - Indian Feudalism - Caste System: Changing Social Structure - Position of Women - Education and Educational Institutions - Development of Sanskrit Language and Literature. Developments in Science and Technology, Astronomy, Mathematics and Medicine - Contact with Neighbouring Countries: Central Asia, South-East Asia, China - Harsha and his Times: Administration and Religion - Salankayanas and Visnukundins in Andhradesa.

Unit - III: Emergence of Regional Kingdoms

Emergence of Regional Kingdoms: Kingdoms in Deccan: Gangas, Kadambas, Western and Eastern Chalukyas, Rashtrakutas, Kalyani Chalukyas, Kakatiyas, Hoysalas and Yadavas - Kingdoms in South India: Pallavas, Ceras, Cholas and Pandyas - Kingdoms in Eastern India: Palas and Senas of Bengal, Varmans of Kamarupa, Bhaumakaras

and Somavamsis of Odisha - Kingdoms in Western India: Maitrakas of Vallabhi and Chalukyas of Gujarat - Kingdoms in North India: Gurjara-Pratiharas, Kalacuri-Chedis, Gahadavalas and Paramaras - Characteristics of Early Medieval India: Administration and Political Structure - Legitimation of Kingship - Agrarian Economy: Land Grants - Changing Production Relations: Graded Land Rights and Peasantry, Water Resources, Taxation System, Coins and Currency System - Trade and Urbanization: Patterns of Trade, Urban Settlements, Ports and Trade Routes, Merchandise and Exchange - Guilds: Trade and Colonization in South- East Asia - Temple Architecture and Regional Styles - Growth of Brahminical Religions: Vaisnavism and Saivism - Temples: Patronage and Regional Ramification - Society: Varna, Jati and Proliferation of Castes - Position of Women: Gender, Marriage and Property Relations - Women in Public Life - Tribes as Peasants and their place in Varna order - Untouchability - Growth of Regional Languages -

Education and Educational Institutions: Institution of Temples and Mathas - Agraharas and Mahaviharas as the Centres of Education - Kayastha System of Teaching - The Arab Invasion of Sindh - Suleiman Ghaznavid conquests - Alberuni's Accounts.

Research in History :

Scope and Importance of History - Objectivity and Bias in History - Criticism in History, Causation of History - History and its Auxiliary Science - Significance of Regional History - Synthesis and Presentation - Recent Trends of Indian History - Research Methodology - Hypothesis in History - Area of Proposed Research - Sources: Data Collection, Primary, Secondary, Original and Transit Sources - Research Versus Review Articles - Trends in Historical Research - Recent Indian Historiography - Selection of Topic in History- Notes Taking, References, Footnotes and Bibliography - Thesis and Assignment Writing - Plagiarism - Beginnings of Historical Writings – Greek, Roman and Church Historiography - Renaissance and its Impact on History Writing - Negative and Positive Schools of Historical Writing - Cyclical Theory of History – Oswald Spengler; Challenge and Response Theory – Arnold Joseph Toynbee; Post Modernism in History.

Unit – IV: Medieval Indian History

Sources of Medieval Indian History: Archaeological: Epigraphic, Numismatic Sources - Material Evidences and Monuments - Chronicles; Literary Sources - Arabic, Persian and Sanskrit Literature - Regional languages - Archival Materials - Foreign Traveller's Accounts: Persian and Arab. Political Developments: Foundation of Delhi Sultanate - The Ghoris, the Turks, the Khaljis, the Tughlaqs, the Sayyids and the Lodis - Decline of Delhi Sultanate - Administrative Structure, Society and Culture, Art and Architecture and Literature during Delhi Sultanate - Religious Movements - Sufism and Bhakti Movement - Famous Saints of Medieval Period - The Mongol Invasions and its Impact- Rise of Provincial Kingdoms - Vijayanagara Bahmani Kingdoms: Vijayanagara Empire - Foundation of Vijayanagara Kingdoms - Krishnadeva Raya - Nature of Vijayanagara State - Nayankara System - Ayagar System - Revenue Administration- Economy - Trade - The Bahmani Kingdom: Administration - Economy and Society - Social Structure.

Mughal Period: Sources and Monuments of the Mughal Period - Foundation of Mughal Empire - Suris - Expansion and Consolidation from Akbar to Aurangzeb - Mughal Relations with the Nobility and the Rajputs - India in the first half of the 17th Century - Jahangir - The Period of Stability of Expansion -The Period of Crises - Nur Jahan - Shah Jahan - Aurangzeb's

Viceroyalty - The Crisis of the Jagirdari System - Decline of Mughal Empire - Later Mughals and Disintegration of the Mughal Empire. Rise of the Marathas - the foundation of Swaraj by Shivaji and its expansion under the Peshwas - Maratha Administration - Asta Pradhan - Mughal Expansion and Consolidation: Maratha Confederacy - Mahadaji Scindia, Maharaj Yashwant Rao Holkar - British Intervention - Decline of Maratha Empire - Deccan Sultanate (Post-Bahamani Era): Ahmadnagar, Berar, Bidar, Bijapur, and Golconda - Rise, Expansion and Disintegration: Eastern Gangas - Anantavarman Chodaganga and Suryavamshi Gajapatis - Kapilendra Deva. Sher Shah Suri - Administrative Reforms and his Contribution - Mughul Administration - Mansabdari System and the Army - Jagirdari System - Organisation of Government and State - Land Revenue System - Inam Grants - Bhaktism: Dana, Tirtha and Bhakti - Tamil Bhakti Movement - Shaivism, Vaishnavism and Shaktism - Nayanmars (Shivism) and Alvars (Vaishnavism) Shankaracharya (Advaita), Ramanuja (Vishista Advaitavada) The Saints of the Medieval Period (North and South) – their impact on Socio-Political and Religious Life – Women Saints of Medieval India - The Sikh Movement – Guru Nanak Dev and His Teachings and Practices, Adi Granth, the Khalsa - Social Classification: The Ruling Classes: The Nobles

and Zamindars - the Rural Gentry - Middle Strata - Major Religious Groups: the Ulemas, the Mercantile and Professional Classes - Trade and Commerce: Dutch and English Traders - Hundis - Foreign Trade and the European Traders - -- Rajput Society: Position of Women – Zanana System – Devadasi System. Development of Education - Madarasa Education - Fine Arts: Major Schools of Painting – Mughal, Rajasthani, Pahari and Garhwali - Development of Music - Art and Architecture: Indo-Islamic Architecture, Mughal Architecture, Regional Styles - Indo-Arabic Architecture - Mughal Gardens - Maratha Forts, Shrines and Temples.

Unit - V: Modern Indian History

Sources of Modern Indian History: Archival Materials, Biographies and Memoirs, Newspapers, Oral Evidence, Creative Literature and Painting, Monuments, Coins - Rise of British Power: The Early European Settlements and Anglo-French Conflicts - European Traders in India in the 16th to 18th Centuries - The Portuguese: Francisco De Almeida - Naval Battle -Maritime Trade and Supremacy over the Indian Ocean - End of Portuguese Power in India - The Dutch: Dutch Settlements in India - Birth and Decline of Coromandel Government - The Dutch in Bengal and Malabar -The English: Establishment and Expansion of British Dominion in India - The French: The Impact of the European Trade - British Relations with Principal Indian States – Bengal, Oudh,

Hyderabad, Mysore, Carnatic and Punjab - Revolt of 1857: Causes, Nature and Impact - Administration of the Company and the Crown - Evolution of Central and Provincial Structure under East India Company. Paramountcy, Civil Service, Judiciary, Police and the Army under the Company - British Policy and Paramountcy in the Princely States under the Crown: Local Self-Government - Constitutional Changes, 1909 – 1935 - Colonial Economy: Changing Composition, Volume and Direction of Trade - Transformation of Indian Economy into Colonial Economy - Expansion and Commercialization of Agriculture: Land Rights, Land Settlements, Rural Indebtedness, Landless Labour, Irrigation and Canal System - Decline of Industries. Changing Socio-Economic Conditions of Artisans - De urbanisation - Economic Drain - World Wars and Economy - British Industrial Policy - Major Modern Industries - Nature of Factory Legislation - Labour and Trade Union Movements - Monetary Policy: Banking, Currency and Exchange - Railways and Road Transport - Communications – Post & Telegraph - Growth of New Urban Centres: New Features of Town Planning and Architecture, Urban Society and Urban Problems - Famines, Epidemics and the Government Policy - Tribal and Peasant Movements.

Indian Society in Transition: Contact with Christianity – the Missions and Missionaries; Critique of Indian Social and Economic Practices and Religious Beliefs; Educational and Other Activities - The New Education: Government Policy- Levels and Contents - English Language - Development of Science, and Technology, Public Health and Medicine – Towards Modernism. Indian Renaissance – Socio-Religious Reforms - Emergence of Middle Class - Caste Associations and Caste Mobility. Women’s Question – Nationalist Discourse - Women’s Organisations - British Legislation concerning Women - Gender Identity and Constitutional Position - The Printing Press – Journalistic Activity and the Public opinion - Modernisation of Indian Languages and Literary Forms – Re-orientation in Painting, Music and Performing Arts.

Rise of Indian Nationalism

Rise of Nationalism: Social and Economic basis of Nationalism - Birth of Indian National Congress - Ideologies and Programmes of the Indian National Congress 1885-1920: Early Nationalists, Assertive Nationalists and Revolutionaries -Trends in Swadeshi and Swaraj Movement - Indian Revolutionary Movement in India and Abroad - Gandhian Mass Movements - Subas Chandra Bose and INA - Role of Middle Class in National Movement - Women Participation in National Movement - Left Wing Politics - Depressed Class Movement - Ideologies and Programmes of the Justice Party - Towards Independence and Partition (1930-1947) - Communal Politics; Muslim League and Genesis of Pakistan - Towards Independence and Partition - Indian Independence Act, 1947 - India Wins Freedom - India after Independence: Challenges of Partition - Integration of the Indian Princely States; Kashmir, Hyderabad and Junagarh - B.R. Ambedkar - The Making of the Indian Constitution and its Features - The Structure of Bureaucracy - New Education Policy - Economic Policies and the Planning process: Development, Displacement and Tribal Issues - Linguistic Re-organisation of States - Centre-State Relations - Foreign Policy Initiatives - Panchsheel - Dynamics of Indian Politics - Emergency - Liberalisation - Privatisation and Globalisation of Indian Economy.

CMRF**Subject: Tourism Administration and Management****Code No: A04****Unit – I: Tourism Principles and Practices**

Tourist/ visitor/ traveller/ excursionist – Definitions and Differences, Early and Medieval Period of Travel, Renaissance and its Effects on Tourism, Birth of Mass Tourism, Grand Tour Old and New Age Tourism, Forms of Tourism – Inbound, Outbound, National, International, Nature, Scope and Characteristics of Tourism. Need for Measurement of Tourism, Interdisciplinary Approaches, Different Tourism Systems- Leiper’s Geo-spatial Model, Mill-Morrison, Mathieson & Wall, Butler’s Tourism Area Life Cycle (TALC) - Doxey’s Irridex Index – Demonstration Effect – Crompton’s Push and Pull Theory, Stanley Plog’s Model, Gunn’s Model

Meaning and Nature of Tourism Industry, Input and Output of Tourism Industry, Tourism Industry Network- Direct, Indirect and Support Services, Basic Components of Tourism - Transport- Accommodation- Facilities & Amenities, , Horizontal and Vertical Integration in Tourism Business, Tourism Business during Liberalization & Globalizations, Tourism Impacts: Economic Social, Cultural, and Environmental; Positive & Negative Impacts of Tourism, Factors affecting the future of tourism business; Seasonality & tourism, Sociology of tourism, Travel motivators.

Role and functions of Important Tourism Organizations in development and promotion of Tourism - UNWTO, IATA, ICAO, UFTAA, ASTA, PATA, WTTC, IHA, TAAI, IATO, FHRAI, ITDC, ICPB, State Tourism Development Corporations, Airport Authority of India, Archaeological Survey of India, Ministry of Tourism, Culture, Railways, Civil Aviation of Government of India.

Earth’s movement; Latitude, Longitude; Areas, Sub Areas and Sub Regions as per International Air Transport Organization (IATA), Traffic conference areas and Sub areas - IATA Three Letter City Code, Two Letter Airlines and Airport Code, International Date Line, Time Zones, Greenwich Mean Time, Calculation of Local Time, Flying Time, Grounding Time, Elapsed Time, Daylight Saving Time.

World Geography - Climate & Vegetation of North, South and Central America – Europe – Africa - Asia & Australasia, Elements of weather and climate, Impact of weather and climate on tourist destinations, Climate and Vegetation of India, Physical Geography of India - Distribution of Rivers, Mountains, Plateaus & Plain area, Coastal area, Deccan, major lakes, deserts.

Tourists Movement - Demand and origin factors; destinations and resource factors; Contemporary trends in international tourists movements, Environment Act – Environment rules – Environmental Impact Assessment (EIA), Environmental Information System (EIS), Environmental Management System (EMS) & Carrying capacity, Forest Act – Forest Conservation Act – Wild life Protection Act

Nature and Characteristic of Tourism Products of India

Seasonality and Diversities, Tourist attraction – Concept & Classification, Heritage – Indigenous; Colonial, Handicrafts of India; Fairs and Festivals of Social & Religious importance, Forms & Types of Performing Art, Classical Dances, Folk Dances of different Regions & Folk Culture, Indian Music – Different Schools, Status of Indian Vocal &

Instrumental Music, Indian Music abroad, Indian Museums, Art Galleries, Libraries & their Location, Indian cuisine - Regional variations, Historical monuments of India – Ancient temples, caves, stupas, monasteries, forts, palaces, Islamic and colonial art and architecture, Indian rituals, dresses. World heritage sites of India, Major religious centers of India – holy places connected with Hinduism, Buddhism, Jainism, Sikhism, Islamism, Christianity, Zoroastrianism and other religious sects, places associated with the work and life of legendry figures – Mahatma Gandhi, Pt. Jawaharlal Nehru, Dr. B.R. Ambedkar, Swami Vivekananda, Rabindranath Tagore, Subash Chandra Bose & Sardar Vallabhai Patel. Important paces related to India’s freedom struggle.

Major National Parks, Wildlife Sanctuaries and Biosphere reserves of India and their Locations –

Accessibility, Facilities, Amenities, Uniqueness of Dachigam, Corbett, Ranthambore, Hazaribag, Simlipal, Bhitarkanika, Kanha, Bandhavagarh, Periyar, Gir, Sunderbans, Manas, Valley of flowers, Hill Stations - Locations, Accessibility, Facilities, Amenities, Uniqueness of Gulmarg, Kullu & Manali, Shimla, Mussorie, Nainital, Panchmarahi, Mahabaleswar, Chikmangulaur, Coorg, Munnar, Arakku, Darjeeling, Gangtok, Shillong, etc., Tourist potential of Himalayas.

Beach Resorts of India - Locations, Accessibility, Facilities, Amenities, Uniqueness of important Beaches of Gujarat, Maharashtra, Goa, Karnataka, Kerala, Tamil Nadu, Puducherry, Andhra Pradesh, Odisha, West Bengal, Lakshadweep, Andaman & Nicobar Islands. Emerging attractions for Medical Tourism, Ecotourism, Rural Tourism, Agri Tourism, Farm Tourism, Green Tourism, Wilderness Tourism, Film Tourism, MICE tourism, Countryside Tourism, Caravan Tourism, Adventure tourism, Golf tourism, Light house tourism, Fort tourism, Buddhist tourism, Sufi tourism, Special interest tourism, Textile tourism, Aqua based tourism, wellness and spa tourism, culinary tourism, shopping tourism, indigenous tourism, industrial & Mining Tourism.

Tourism in Tamil Nadu

TTDC- Enchanting TamilNadu - UNESCO World Heritage sites in TamilNadu – Archaeological Sites in TamilNadu: Adichanallur, Keezhadi, Arikamedu – Medical Tourism in TamilNadu: Chennai – Health capital of India – Art and architecture in TamilNadu – Nature watch Eco tours: Courtallam, Valparai, Ooty, Yercaud, Kodaikanal, Mudumalai, Munandurai, Pulicat – Souvenirs of TamilNadu – Handicrafts-Woodcraft, Musical Instruments, Jewellery, Tanjore paintings, silk and sungudi sarees, palmyra palms.

Unit II: Transportation

Evolution and importance of Transportation Systems; Role of Transportation in Tourism; Major transport systems – Rail, Road, Air and Water transport; Road Transport Network in North America, South America, Europe, South Africa, Asia and the Middle-East, Austria and New Zealand, Major Railway Transport Network in the World, Modes of transportations in India – Past & Present.

Licensing of air carriers

Limitations of weights and capacities; Scheduled and non-scheduled airlines services; No-frill airlines; Open sky policy; International conventions; Functions of IATA, ICAO, DGCA, AAI; GDS in air transportation. Types of air journey, MPM, TPM, Extra Mileage Allowance, One-

way, Return Trip and Circle Tri Journey, Higher Intermediate Fare Check Point, Add-on and Open Jaw Fare, Excursion Fare , Components in International Air Tickets, Airline Business in the World, Major Air Carriers and Major Low-cost Airlines, Domestic Air Transport Business, Distribution of Sales of Airlines Tickets, Baggage and Travel Documents, Air Charter Services, Miscellaneous Charges order (MCO) - Multiple Purpose Document (MPD) - Billing and Settlement Plan.

Surface Transport System

Approved tourist transport, car hire companies including car rental scheme and tourist-coach companies, Documents connected with road transport viz. Regional Transport Authority, transport and insurance documents, road taxies, fitness certificate, contact carriage, state carriage, All India permits, maxi car, motor car etc. Railway System of world, British Rail, Euro Rail, Amtrak, Orient express, Trans-Siberian railway and luxury train of the world. Indian Railways - IRCTC, Types of tours available in Indian Rail, Indrail pass, special schemes and packages available, palace on wheels, royal orient, fairy queen and toy trains. Travel circuits in India Planning itineraries on Indian Railways, reservation and cancellation procedures, Water Transport System - Historical past, cruise ships, ferries, hovercraft, river canal boats. Prospects and future growth of water transport in India. Major cruise lines of the world and their packages

Travel Agency and Tour Operation Business

Historical Background of Travel Trade, Significance of Travel Agency Business, Types of Travel Agent- Full Service Agency, Commercial Agency, Implant Agency, Group / Incentive Agency, Skills and Competencies for Running Travel Agency Business, Wholesale and Retail Agents, Future of Travel Wholesaling & Retailing. Types of Tour Operator- Inbound, Outbound, Domestic, Ground and Specialized, Types of Tour- Independent Tour, Escorted Tour, Hosted Tour, Incentivized Tour, Tour Wholesalers and Retailers, Diversified Role of Tour Operators, Distribution Networks of Tour Operation Business, Special Services for Charter Tour Operators, Meeting & Incentive Planners and Activities of Meeting Planners, Convention & Conference Tourism Business, Trade Fairs & Exhibitions, Essential Requirements for Starting Travel Agency & Tour Operation Business, Procedures for Obtaining Recognition, Travel Agency Organization Structure, Sources of Revenue, Use of Information Technology in Travel Agency Business.

Types of Itinerary - Resources and Steps for Itinerary Planning, Tour Costing: Tariffs, FIT & GIT, Confirmation of Tour, Creation of Docket/ File, Issue of Tour Vouchers, Reconfirmation with Airlines, Hotel & Ground Service Providers, Distributing Customized Itinerary to Tour Leader, Guide, Driver & Transporter, Standard Procedures for Pickup and Drop, Preparation of Feedback or Guest Comment Sheet, Analysis of Comments of Guest, Tour Guides & Escorts, WATA guidelines; Relation with service suppliers; Travel agency appointments; International regulations.

Familiarization with TIM (Travel Information Manual), Passport & VISA- Meaning, Types, Procedures, Validity, Necessary Information to fill the Passport and VISA Form for Issuance, Health Certificates, Currency, Travel Insurance, Credit & Debit Card, Customs, Currency, Baggage and Airport information, Citizenship – Passport - Visa - FEMA – Foreigners Registration Act – Customs – RBI guidelines - Criminal Law - Registration of cases, Cargo handling - Baggage allowance, free access baggage, Weigh and piece concept, Accountability of lost baggage, Dangerous goods, Cargo rates and valuation charges Automation and airport procedures, Tour Brochures - element and importance of brochure.

Unit III: Hospitality Management

Distinctive characteristics of Hospitality Industry - Inflexibility, Intangibility, Perishability, fixed location, relatively large financial investment etc.; Concepts of Atithi Devo Bhavah; Hotel and the other lodging facilities; types of hotels and hotel departments; classification of hotels; chain operations; E- Hospitality. Types of accommodation; Activities in Accommodation Management – Front office – Housekeeping – Bar and Restaurant -Supporting services; Fiscal and non-fiscal incentives offered to hotel industry in India, ethical and regulatory aspects in a hotel, international hotel regulations.

Duties and responsibilities of front office staff; Reservation & registration- Types of Room, Types of Bedding, Meal plans, room assignments, check-in, methods of payment, type of hotel guests. Factors affecting the price of accommodation, important functions of Housekeeping Management, liaison with other departments, room supplies, Bed making and related types of service; Housekeeping department-Hierarchy, duties & responsibilities of housekeeping staff.

Food Production Organization, Kitchen, Buffets, Beverages Operation, Functions, Outlets of F & B, Types of Meal Plans, Types of Restaurant-Menu, Room Service, Catering Services-Food Service for the Airlines, Banquette, Corporate, MICE, Retail Food Market, Business/Industrial Food Service, Healthcare Food Service, club food services - Trends in lodging and food services. Food & Beverage Department of a hotel: Hierarchy, duties & responsibilities of staff.

Tourism Marketing

Concept of Goods & Services; Characteristics of Service; Salient features of Marketing Services: Services Marketing – Concept, Need & Significance, Types of Tourism Services, Tourism Marketing Environment, Strategic Planning and Marketing Process, Organizing and Implementing marketing in the Tourism Organization. Service Quality, Gap Model of Service Quality. Marketing Research. Market Segmentation - Targeting and positioning for competitive advantage; Relationship Marketing; Familiarization Trip.

P's of Tourism Marketing- Product, Place, Price, Promotion, Physical Evidence, People, Process & Packaging, Designing Tourism Product – Branding and Packaging, Product Development – Product Life Cycle & Its Various Stages, Pricing Strategies and Approaches, Advertising – Sales Promotion – Publicity – Personal Selling, Tourism Distribution Channels, Cooperation and conflict Management. Global Marketing, Direct Marketing, Social Media & Digital Marketing, Green Marketing, Corporate Social Responsibility, Marketing Ethics & Consumerism.

Destination Image Development - Attributes of Destinations, Destination resource analysis, measurement of destination image - Destination branding perspectives and challenges-Creating the Unique Destination Proposition - Place branding and destination image - Destination image formation process; unstructured image -Product development and packaging – Institutional Support & Public Private Partnership in Destination Marketing.

Unit - IV: Tourism planning

Role of Govt. public and private sectors in formulation of tourism policy; Roles of international, national, state and local tourism organizations in carrying out tourism policies. Tourism planning for thrust areas, special tourism areas & zones identified by Ministry of Tourism, Government of India. Sustainable tourism development, Pro-poor Tourism and Community Participation; Responsible tourism.

Tourism Policy - Factors influencing tourism policy; National Tourism Policy, Levels of Tourism planning - International, national, regional, state and local, the traditional, approach and PASLOP method of tourism planning; important feature of five year tourism plans in India; Elements Agents, Processes and typologies of tourism development; State tourism policies. National Planning Policies for Destination Development- WTO Guidelines for Planners - Role of urban civic bodies: Town planning -Characteristics of rural tourism planning.

Economic System and Its Impact on Tourism Development, Macro & Micro Economic System, Demand & Supply, Determinants , Measurement of Tourism Demand, Forecasting, Methods of Demand Forecasting, Inflation, Recession, Savings & Investment, Export & Import, Multiplier Effects &Its Types, Displacement Effect, Costs and Benefits of Tourism, Monetary Policy- Repo Rate, Reverse Repo Rate, Cash Reserve Ratio(CRR).

Statistics and Tourism Research Methodology

Statistics- Measures of central tendency- mean, median, mode; measures of dispersion- range, standard deviation, variance, etc.; skewness and kurtosis; correlation and regression- scatter plots, lines of best fit, Pearson and Spearman correlation coefficients; Regression- bivariate and multivariate. Distributions- discrete and continuous; Normal distribution, sampling distribution. hypothesis testing – parametric vs. non-parametric tests, t-tests, ANOVA, Chi-square tests, run Test, sign tests, Wald- Walfowitz Test, Kursal Walis Test, Komogrov- Smirnov Test.

Research and theory, types and methods of research; review of literature; variables and measurement, concepts, constructs and formulation of hypothesis; Sampling, methods of data collection, development of schedules and questionnaires, scales and fieldwork. Qualitative research: quantitative vs. qualitative research; techniques- Grounded Theory, Ethnography, Case method of research, Content Analysis, Phenomenology, Narrative research, mixed methods.

Analysis, tools- Factor analysis, discriminant analysis, conjoint analysis, multiple regression, etc. Report writing, types of report.

Unit - V: Organisational Behaviour

Managerial processes, functions, skills, and roles in organization, Systems, contingency and operational approaches to management. External and internal environment affecting managerial decisions – social responsibilities of business – evolution of management thought; functions of planning, organizing, staffing, directing and controlling.

Understanding & Managing Individual & Group Behaviour – Personality, Perception, Learning, Values & attitudes, persuasion, Theories of Motivation, Factors affecting group behaviour, group & individual dimensions, understanding work team, Communication, Leadership & influence process, Organization structure, centralization vs decentralization, strategy & structure, flat & tall structures, work specialization, departmentalization, chain of command, span of control and formalization, Common organizational designs - Simple, bureaucratic, matrix, virtual, boundary less, feminine – Organization as an open system & influence of environment over organizational dynamics with reference to technological innovations.

Accounting and Financial Management

Basic Accounting Records and Books of Accounts, Double Entry System, Journal, Ledger, Trial Balance, Cash Book, Depreciation Accounting, Final Accounts with Adjustments. Hotel Accounting, Financial management, Concept of raising funds, capital structure, capital budgeting, Internal financial control- meaning, problems unique to hospitality industry, Establishing cost standard, Types of budget, preparation of budget, and zero based budgeting, working capital Management, cash management, Opportunities and challenges for investments in hotel, aviation & Tourism related sectors, Role of TFCI and other financial organizations. Elements of Contract Act – Breach of Contract – Performance of Contract – Indemnity & Guarantee – Bailment - Consumer Protection Act.

CMRF**Subject: GEOGRAPHY****Code No: A05****UNIT-I****Geomorphology**

Continental Drift, Plate Tectonics, Endogenetic and Exogenetic forces. Denudation and Weathering, Geomorphic Cycle (Davis and Penck), Theories and Process of Slope Development, Earth Movements (seismicity, folding, faulting and vulcanicity), Landform Occurrence and Causes of Geomorphic Hazards (earthquakes, volcanoes, landslides and avalanches)

Climatology

Composition and Structure of Atmosphere; Insolation, Heat Budget of Earth, Temperature, Pressure and Winds, Atmospheric Circulation (air-masses, fronts and upper air circulation, cyclones and anticyclones (tropical and temperate), Climatic Classification of Koppen & Thornthwaite, ENSO Events (El Nino, La Nina and Southern Oscillations), Meteorological Hazards and Disasters (Cyclones, Thunderstorms, Tornadoes, Hailstorms, Heat and Cold waves Drought and Cloudburst, Glacial Lake Outburst (GLOF), Climate Change: Evidences and Causes of Climatic Change in the past, Human impact on Global Climate.

UNIT-II**Oceanography**

Relief of Oceans, Composition: Temperature, Density and Salinity, Circulation: Warm and Cold Currents, Waves, Tides, Sea Level Changes, Hazards: Tsunami and Cyclone.

Geography of Environment Components: Ecosystem (Geographic Classification) and Human Ecology, Functions: Trophic Levels, Energy Flows, Cycles (geo-chemical, carbon, nitrogen and oxygen), Food Chain, Food Web and Ecological Pyramid, Human Interaction and Impacts, Environmental Ethics and Deep Ecology, Environmental Hazards and Disasters (Global Warming, Urban Heat Island, Atmospheric Pollution, Water Pollution, Land Degradation), National Programmes and Policies: Legal Framework, Environmental Policy, International Treaties, International Programmes and Policies (Brundtland Commission, Kyoto Protocol, Agenda 21, Sustainable Development Goals, Paris Agreement)

UNIT -III**Population and Settlement Geography****Population Geography**

Sources of population data (census, sample surveys and vital statistics, data reliability and errors). World Population Distribution (measures, patterns and determinants), World Population Growth (prehistoric to modern period). Demographic Transition, Theories of Population Growth (Malthus, Sadler, and Ricardo). Fertility and Mortality Analysis (indices, determinants and world patterns). Migration (types, causes and consequences and models), Population Composition and Characteristics (age, sex, rural-urban, occupational structure and educational levels), Population Policies in Developed and Developing Countries.

Settlement Geography

Rural Settlements (types, patterns and distribution), Contemporary Problems of Rural Settlements (rural-urban migration; land use changes; land acquisition and transactions), Theories of Origin of Towns (Gordon Childe, Henri Pirenne, Lewis Mumford), Characteristics and Processes of Urbanization in Developed and Developing Countries (factors of urban growth, trends of urbanisation, size, structure and functions of urban areas). Urban Systems (the law of the primate city and rank size rule) Central Place Theories (Christaller and Losch), Internal Structure of the City, Models of Urban Land Use (Burgess, Harris and Ullman, and Hoyt), Concepts of Megacities, Global Cities and Edge Cities, Changing Urban Forms (peri-urban areas, rural-urban fringe, suburban, ring and satellite towns), Social Segregation in the City, Urban Social Area Analysis, Manifestation of Poverty in the City (slums, informal sector growth, crime and social exclusion).

Geography of Economic Activities and Regional Development Economic Geography: Factors affecting spatial organisation of economic activities (primary, secondary, tertiary and quaternary), Natural Resources (classification, distribution and associated problems), Natural Resources Management. World Energy Crises in Developed and Developing Countries.

Agricultural Geography

Land capability classification and Land Use Planning, Cropping Pattern: Methods of delineating crop combination regions (Weaver, Doi and Rafiullah), Crop diversification, Von Thunen's Model of Land Use Planning. Measurement and Determinants of Agricultural Productivity, Regional variations in Agricultural Productivity, Agricultural Systems of the World.

Industrial Geography

Classification of Industries, Factors of Industrial Location; Theories of Industrial Location (A. Weber, E. M. Hoover, August Losch, A. Pred and D. M. Smith). World Industrial Regions, Impact of Globalisation on manufacturing sector in Less Developed Countries, Tourism Industry, World distribution and growth of Information And Communication Technology (ICT) and Knowledge Production (Education and R & D) Industries.

Geography of Transport and Trade: Theories and Models of spatial interaction (Edward Ullman and M. E. Hurst) Measures and Indices of connectivity and accessibility; Spatial Flow Models: Gravity Model and its variants, World Trade Organisation, Globalisation and Liberalisation and World Trade Patterns. Problems and Prospects of Inter and IntraRegional Cooperation and Trade.

Regional Development

Typology of Regions, Formal and Fictional Regions, World Regional Disparities, Theories of Regional Development (Albert O. Hirschman, Gunnar Myrdal, John Friedman, Dependency theory of Underdevelopment, Global Economic Blocks, Regional Development and Social Movements in India

Unit-IV

Cultural, Social and Political Geography Cultural and Social Geography

Concept of Culture, Cultural Complexes, Areas and Region, Cultural Heritage, Cultural Ecology. Cultural Convergence, Social Structure and Processes, Social Well-being and Quality of Life, Social Exclusion, Spatial distribution of social groups in India (Tribe, Caste, Religion and Language), Environment and Human Health, Diseases Ecology, Nutritional Status (etioloical conditions, classification and spatial and seasonal distributional patterns with special reference to India) Health Care Planning and Policies in India, Medical Tourism in India.

Political Geography

Boundaries and Frontiers (with special reference to India), Heartland and Rimland Theories. Trends and Developments in Political Geography, Geography of Federalism, Electoral Reforms in India, Determinants of Electoral Behaviour, Geopolitics of Climate Change, Geopolitics of World Resources, Geo-politics of India Ocean, Regional Organisations of Cooperation (SAARC, ASEAN, OPEC, EU). Neopolitics of World Natural Resources.

Unit V

Geographic Thought

Contributions of Greek, Roman, Arab, Chinese and Indian Scholars, Contributions of Geographers (Bernhardus Varenius, Immanuel Kant, Alexander von Humboldt, Carl Ritter, Scheafer & Hartshorne), Impact of Darwinian Theory on Geographical Thought. Contemporary trends in Indian Geography: Cartography, Thematic and Methodological contributions. Major Geographic Traditions (Earth Science, man- environment relationship, area studies and spatial analysis), Dualisms in Geographic Studies (physical vs. human, regional vs. systematic, qualitative vs. quantitative, ideographic vs. nomothetic), Paradigm Shift, Perspectives in Geography (Positivism, Behaviouralism, Humanism, Structuralism, Feminism and Postmodernism).

Geographical Techniques

Sources of Geographic Information and Data (spatial and non-spatial), Types of Maps, Techniques of Map Making (Choropleth, Isarithmic, Dasymetric, Chorochromatic, Flow Maps) Data Representation on Maps (Pie diagrams, Bar diagrams and Line Graph, GIS Database (raster and vector data formats and attribute data formats). Functions of GIS (conversion, editing and analysis), Digital Elevation Model (DEM), Georeferencing (coordinate system and map projections and Datum), GIS Applications (thematic cartography, spatial decision support system), Basics of Remote Sensing (Electromagnetic Spectrum, Sensors and Platforms, Resolution and Types, Elements of Air Photo and Satellite Image Interpretation and Photogrammetry), Types of Aerial Photographs, Digital Image Processing: Developments in Remote Sensing Technology and Big Data Sharing and its applications in Natural Resources Management in India, GPS Components (space, ground control and receiver segments) and Applications, Applications of Measures of Central Tendency, Dispersion and Inequalities, Sampling, Sampling Procedure and Hypothesis Testing (chi square test, t test, ANOVA), Time Series Analysis, Correlation and Regression Analysis, Measurement of Indices, Making Indicators Scale Free, Computation of Composite Index, Principal Component Analysis and Cluster Analysis, Morphometric Analysis: Ordering of Streams, Bifurcation Ratio, Drainage Density and Drainage Frequency, Basin Circularity Ratio and Form Factor, Profiles, Slope Analysis, Clinographic Curve, Hypsographic Curve and Altimetric Frequency Graph.

Geography of India

Major Physiographic Regions and their Characteristics; Drainage System (Himalayan and Peninsular), Climate: Seasonal Weather Characteristics, Climatic Divisions, Indian Monsoon (mechanism and characteristics), Jet Streams and Himalayan Cryosphere, Types and Distribution of Natural Resources: Soil, Vegetation, Water, Mineral and Marine Resources. Population Characteristics (spatial patterns of distribution), Growth and Composition (rural-urban, age, sex, occupational, educational, ethnic and religious), Determinants of Population, Population Policies in India, Agriculture (Production, Productivity and Yield of Major Food Crops), Major Crop Regions, Regional Variations in Agricultural Development, Environmental, Technological and Institutional Factors affecting Indian Agriculture; Agro-Climatic Zones, Green Revolution, Food Security and Right to Food. Industrial Development since Independence, Industrial Regions and their characteristics, Industrial Policies in India. Development and Patterns of Transport Networks (railways, roadways, waterways, airways and pipelines), Internal and External Trade (trend, composition and directions), Regional Development Planning in India, Globalisation and its impact on Indian Economy, Natural Disasters in India (Earthquake, Drought, Flood, Cyclone, Tsunami, Himalayan Highland Hazards and Disasters.)

CMRF**Subject: POLITICAL SCIENCE****Code No:A06 SYLLABUS****Unit - I: Political Theory, Political Thought, Indian Political Thought**

Nature and Scope of Political Science, Approaches to the Study Of Political Science, Theories of Origin and Functions of State, Sovereignty, Liberty, Equality, Justice. Rights, Democracy, Power, Citizenship, Liberalism, Conservatism, Socialism, Marxism, Feminism, Ecologism, Communitarianism, Fascism, Multiculturalism, Post Modernism.

Confucius, Plato, Aristotle, Machiavelli, Hobbes, Locke, Rousseau, Hegel, Mary Wollstonecraft, John Stuart Mill, Karl Marx, Gramsci, Hannah Arendt, Mao Zedong, John Rawls,

Dharamshastra, Kautilya, Aggannasutta, Barani, Kabir, Pandita Ramabai, Bal Gangadhar Tilak, Swami Vivekanand, Rabindranath Tagore, M.K Gandhi, Sri Aurobindo, Periyar E. V. Ramasamy, Muhammad Iqbal, M.N.Roy, V D Savarkar, Dr. B.R.Ambedkar, J L Nehru, Ram Manohar Lohia, Jaya Prakash Narayan, Deendayal Upadhyaya

Unit - II: Comparative Political Analysis

Approaches: Institutional, Political Culture, Political Economy and New Institutionalism; Comparative Methods

Colonialism and Decolonization: Forms of Colonialism, Anti-Colonial Struggles and Decolonization

Nationalism: European and Non-European.

State Theory: Debate Over the Nature of State in Capitalist and Socialist Societies; Post-Colonial State; Welfare State; Globalization and Nations-States.

Political Regimes: Democratic (Electoral, Liberal, Majoritarian and Participatory) And Non-Democratic Regimes (Patrimonialism, Bureaucratic Authoritarianism, Military Dictatorship, Totalitarianism, And Fascist). Constitutions and Constitutionalism: Forms of Constitutions, Rule of Law,

Judicial Independence and Liberal Constitutionalism; Emergency Powers and Crisis of Constitutionalism.

Democratization: Democratic Transition and Consolidation.

Development: Underdevelopment, Dependency, Modernization, World Systems Theory, Development and Democracy.

Structures of Power: Ruling Class, Power Elites, Democratic Elitism

Actor and Processes: Electoral Systems, Political Parties and Party System, Interest Groups, Social Movements, New Social Movements, Non-Governmental Organisations (NGOs) and Civil Society Campaigns; Revolutions.

Unit - III: International Relations

Approaches to the Study of International Relations: Idealism, Realism, Structural Marxism, Neoliberalism, Neorealism, Social Constructivism, Critical International Theory, Feminism, Postmodernism.

Concepts: State, State System and Non-State Actors, Power, Sovereignty, Security: Traditional and Non-Traditional. Conflict and Peace: Changing Nature of Warfare; Weapons of Mass Destruction; Deterrence; Conflict Resolution, Conflict Transformation.

United Nations: Aims, Objectives, Structure and Evaluation of the Working Of UN; Peace and Development Perspectives; Humanitarian Intervention. International Law; International Criminal Court. Political Economy of IR; Globalisation; Global Governance and Bretton Woods System, North-South Dialogue, WTO, G-20, BRICS. Regional Organisations: European Union, African Union, Shanghai Cooperation Organisation, ASEAN. SAARC

Contemporary Challenges: International Terrorism, Climate Change and Environmental Concerns, Human Rights, Migration and Refugees; Poverty and Development; Role of Religion, Culture and Identity Politics.

India's Foreign Policy

Perspectives on India's Foreign Policy: India's Identity as Postcolonial, Development, Rising Power and as Emerging Political Economy Continuity and Change in India's Foreign Policy: Principles and Determinants; Non-Alignment Movement: Historical Background and Relevance of Non Aligned Movement; India's Nuclear Policy

India's Relations with Major Powers: USA, USSR/Russia, People's Republic of China

India's Engagement with Multipolar World: India's Relations with European Union,

BRICS, ASEAN, Shanghai Cooperation Organisation, African Union, Southern African Development Community, Gulf Cooperation Council

India's Relations with Neighbourhood: SAARC, Gujral Doctrine, Look East / Act East, Look West. Soft Power of India

India's Negotiation Strategies in International Regimes: The United Nations, World Trade Organisation, International Monetary Fund, Intergovernmental Panel on Climate Change

Contemporary Challenges: Maritime Security, Energy Security, Environmental Security, Migrants and Refugees, Water Resources, International Terrorism, Cyber Security

Unit 4: Political Institutions in India

Making of the Indian Constitution: Colonialism Heritage and the Contribution Indian National Movement to the Making of the Indian Constitution

Constituent Assembly: Composition, Ideological Moorings, Constitutional Debates Philosophy of the Constitution: Preamble, Fundamental Rights, Directive Principles of State Policy

Constitutionalism in India: Democracy, Social Change, National Unity, Checks and Balances, Basic Structure Debate, Constitutional Amendments Union Executive: President, Prime Minister and Council Of Ministers

Union Parliament: Structure, Role and Functioning, Parliamentary Committees Judiciary: Supreme Court, High Court, Judicial Review, Judicial Activism, Judicial Reform.

Executive and Legislature in the States: Governor, Chief Minister, State Legislature Federalism In India: Strong Centre Framework, Asymmetrical Federal Provisions and Adaption, Role Of Intergovernmental Coordination Mechanisms, Inter-State Council, Green Federalism, Emerging Trends.

Electoral Process and Election Commission of India: Conduct of Elections, Rules, Electoral Reforms.

Local Government Institutions: Functioning and Reforms.

Constitutional and Statutory Bodies: Comptroller and Auditor General, National Commission For Scheduled Castes, National Commission For Scheduled Tribes, National Commission For Human Rights, National Commission For Women, National Commission For Minorities.

Political Processes in India

State, Economy and Development: Nature of Indian State, Development Planning Model, New Economic Policy, Growth and Human Development.

Process of Globalisation: Social and Economic Implications. Identity Politics: Religion, Tribe, Caste, Region, Language. Social Movements: Dalit, Tribal, Women, Farmers, Labour.

Civil Society Groups: Non-Party Social Formations, Non-Governmental Organisations, Social Action Groups.

Regionalisation of Indian Politics: Reorganisation of Indian States, States As Political and Economic Units, Sub-State Regions, Regional Disparities, Demand for New States,

Gender and Politics in India: Issues of Equality and Representation, Women Reservation

Ideology and Social Basis of Political Parties: National Parties, State Parties.

Electoral Politics: Participation, Contestation, Representation, Emerging Trends.

UNIT 5:

Public Administration

Public Administration: Meaning and Evolution; Public and Private Administration Approaches: System Theory, Decision Making, Ecological Approach Public Administration Theories and Concepts: Scientific Management Theory, Rational Choice Theory, New Public Administration, Development Administration, Comparative Public Administration, New Public Management, Changing Nature of Public Administration in the Era of Liberalisation and Globalisation

Theories and Principles of Organization: Scientific Management Theory, Bureaucratic Theory, Human Relations Theory

Managing The Organization: Theories of Leadership and Motivation. Organisational Communication: Theories and Principles, Chester Bernard

Principles of Communication, Information Management in the Organization Managing Conflict in the Organization: Mary Parker

Follett Management by Objectives- Peter Drucker

Governance and Public Policy in India

Governance, Good Governance and Democratic Governance, Role Of State, Civil Society And Individuals.

Accountability and Control: Institutional Mechanism For Checks And Balances, Legislative Control Over Executive, Administrative and Budgetary Control, Control Through Parliamentary Committees, Judicial Control Over Legislature And Executive, Administrative Culture, Corruption And Administrative Reforms Institutional Mechanisms for Good Governance: Right to Information, Consumer Protection Act, Citizen Charter; Grievance Redress System: Ombudsman, Lokpal, Lokayukta

Grassroots Governance: Panchayati Raj Institutions and their Functioning Planning and Development: Decentralized Planning, Planning For Development, Sustainable Development, Participatory Development, E-Governance; NITI Aayog Public Policy as an Instrument Of Socio-Economic Development: Public Policies With Special Reference To Housing, Health, Drinking Water, Food Security, MNREGA, NHRM, RTE

Monitoring and Evaluation of Public Policy; Mechanisms of Making Governance Process Accountable: Jansunwai, Social Audit.

CMRF**Subject: Social Work****Code No: A07****UNIT I****Nature and Development of Social Work**

- **Social Work:** Definition, Scope, Principles, Nature, Goals and Process
- **Historical Development:** Development of Professional Social Work across the world (U.K., U.S.A., and India)
- **Social Reform and Professional Social Work:** Contribution of Social Reformers in 19th and 20th Century in the development of Professional Social Work in India.
- **Social Work as a Profession in India:** Values, Competencies and Code of Ethics for the Social Work Practitioners.
- **Theories:** Theories for Social Work Practice.
- **Changing Context of Social Work Practice:** Emerging Perspectives, Trends and Challenges of Social Work for Practice.
- **Social Work Practice in various settings:** (Family, Child and Youth welfare, Industry, Older Persons, Persons with Disabilities, Environment, Women and Welfare, Healthcare and Disaster Management.) Society, Human Behavior and Communities
- **Sociological Concepts:** Social Structure, Social Institutions and Social Groups, Socialization, Social Control and Social Change.
- **Approaches to the study of Society:** Functionalist, Conflict/Dialectical, Structuralism and Post Modernism.
- **Social System and Stratification:** Major Social Systems (Family and Religion), Social Stratification : Marxist, Functionalist and Weberian approach.
- **Human Behavior:** Normal and Abnormal Behaviour Determinants and Life span perspective of Human Development, Development Tasks and Hazards during Pre Natal Period, Infancy, Babyhood, Childhood, Puberty, Adolescence and Adulthood.
- **Theories of Personality:** Psycho Analytic Theory of Personality, Behavioral theories and Humanistic theories.
- **Social Psychology:** Social Perception, Attitude formation, Change and Measurement, Communication and Theories of Collective Behavior.
- **Type of Communities:** Rural, Urban, Tribal and Virtual Communities and various Vulnerable Groups / sections viz. Women, Child, Aged, Dalits etc.; Caste and Class – Their Characteristics.

UNIT II**Social Work with Individuals and Groups**

- **Basic Social Case Work Concepts :** Social Roles, Social Functioning, Need Assessment, Adaptation, Social environment, Person-in-Environment Fit, Principles and Components.
- **Approaches to Social Case Work Practice:** Diagnostic and Functional Approach, Problem Solving, Task Centered and Radical Approach
- **Process and Techniques of Social Case Work:** Phases of Case Work Intervention, Techniques of Case Work Intervention, Principles of Interviewing and Case Work Recording
- **Social Group Work:** Definition, Characteristics, Functions and Group Structure, Classification of Groups and making of Social Groups, Issues of Identity, Diversity and Marginalization.

- **Social Group Work Process and Group Dynamics :** Principles, Determinants, Indicators and Outcomes, Decision making and Problem Solving Process, Theories of Leadership, Roles and Responsibilities of Group Leaders.
- **Group Development :** Stages of Group Work, Techniques and Skills in Group Work, Group Climate, Communication in Groups, Use of Programme Media and Group Work Recording, Monitoring and Evaluation.
- **Practice Sites of Social Case Work and Social Group Work :** Client Groups and various settings (Children, Correctional, Health, Women, Persons with Disabilities, Older Persons, Oppressed Groups, Religious Minorities, Persons who are Gay & Lesbian and other Socially and Economically Disadvantaged Groups)

Social Work with Communities and Social Action

- **Community Organization:** Concept, Definition, Scope and Historical Perspective in India, UK, and USA, The Role of Community-Based Organizations, Human Capital & Social Capital.
- **Process of Community Organization:** Steps in Community Organization, Methods, Principles, Skills, Assumptions, Record Maintenance, Involving NGOs in Community Organization.
- **Approaches in Community Organization Practice –** Models, Strategies, The role of Community Based Organizations, Leadership Development and Leaders, Building Partnerships and coalitions.
- **Social Action and Social Movements:** Concept, History, Social Action as a Method of Social Work.
- **Models of Social Action:** Conscientisation model of Paulo Freire, Role of ideology, Saul Alinsky as a radical community organizer, Liberation Theology.
- **Social Movements:** Origin, Nature, Types of Movements, Theories of Movement and new Social Movements
- **Social Movements, Social Action and Social Change:** Movement Analysis : Ideology, Structure, Leadership, Process and Outcomes, Analysis of ideology and approach of (Gandhi, Martin Luther King Jr. and Frantz Fanon)

Unit III

Research in Social Work : Quantitative and Qualitative Approaches Quantitative Research

- **Basics of Social Science Research :** Meaning of Research, Social Science and Social Work Research : Meaning, Nature and Scope.
- **Steps in Social Science Research :** Identifications and Formulations of Research Problem, Literature Review, Objectives and Hypothesis Formulation, Research Design, Sample Design, Sources, Methods and Tools of Data Collection, Processing and Analysis of Data and Writing Research Reports including Presentations and Styles of References, Citing and Paraphrasing.
- **Basic Statistical concepts :** Process of statistical Enquiry and dealing with Descriptive and Inferential Statistical Methods, Parametric and Nonparametric Tests.

Qualitative Research

- **Qualitative Research :** Meaning, Basic tenets of Qualitative Research, Difference between Quantitative and Qualitative Approach to Research in social Work.
- **Designing Qualitative Research:** Steps, Methods of Qualitative Research (Field study, Case Study, Focus Group Discussions, Narratives, Observation and Theoretic Research)
- **Managing Qualitative Data :** Procedures and Techniques of Analyzing Qualitative Data and Report Writing.

- **Mixed Method Research** : Components of Mixed Methods, Procedures of Combining Quantitative and Qualitative research.

Administration, Welfare and Development Services

- **Social Welfare Administration** : Meaning, History, Principles, Nature and Type of Organizations.
- **Types of Administration**: Distinction between Social Welfare Administration, Public administration and Social Security administrations.
- **Registration of Welfare Agencies**: Laws relating to Societies, Trust and Non – Profit organizations, Challenges
- **Structure of Social Welfare Administration** : Service Providers, Administrative structures (Government and Non - Government), Organization and Management of Institutional Welfare Services.
- **Components of Administration** : Planning, Coordination, Staff Recruitment, Training and Development, Recording and Documentation, Budgeting, Monitoring and Evaluation, Networking and Maintaining Public Relations.
- **Strategies and Mechanisms of Administration**: Role of Social Workers in Decision Making Process, Communication, Role Description and Functioning, Sustainability of Programmes.
- **Fund raising and Resource Mobilization**: Grant-in-aid (Principles and Procedures), Resource Mobilization, Financial Administration and Social Marketing – Process and Models.

UNIT IV

Social Policy, Planning and Social Development

- Social Policy : Concept, Goals, Scope , Context and Models of Social Policy and applicability in Indian context.
- Historical Development: Evolution and Historical perspective of various Policies, Implementation of Social Policies especially for Marginalized and Vulnerable sections of the society.
- Process of Policy Formulation : Determinants and Steps, Approaches to Social Policy formulation , Impact of changing Political Scenario in a country.
- Social Planning; Concept, Objectives, Scope, Models, Interrelationship between Social and Economic Planning, Social Planning in India.
- Five Year Plans: Changes in Social Planning with Five Years Plans in India, Social Planning and Social Change , Factors leading to development of planning in India. Roles and functions of Niti Aayog.
- Social Development: Positive and Negative Dimensions of Social Development; Concept, Models and Theories, Historical and Social Context of Development in India,
- Sustainable Development: Concept, Strategies, Critical issues , Salient Features of Social Development. Approaches to Social Development; Similarities and Differences. Strategic Development Goals, Human Development Index and Indicators for Policies and Programmes.

Indian Constitution, Social Justice, Human Rights and Social Work Practice

- Indian Constitution: Characteristics, Features, Preamble, Directive Principles of State Policy and Articles.
- Social Justice : Concept, Definition, Historical Development, Dimensions, Manifestations and Social Justice as a Core value of Social Work Profession.
- Social Justice and Leadership: Community Building, Personal and Community Empowerment, Social Justice and Technology, Promoting a Plan and Vision for Change, Reflections and Connection, Social Reconstructions, Paradigms, Policies, Privileges, Implications of Social Justice for Policy Formulation.

- Instrument of Social Justice : Constitutional Base and Indian Legal System, Legal and Public Advocacy, Role of Civil Society as a Pressure group, Statutory bodies.
- History of Human Rights: Concept and Historical Context of Human Rights, Human Rights Declarations, Treaties and Conventions, Human Rights and Protection Systems, Human Rights in the Indian Context.
- Human Rights and Social Work : Code of Ethics of Social work and Protection of Human Rights, Human Rights perspective in Social Work Practice, Ethnic sensitive practice, Feminist Practice, Social Work with Diverse Groups.
- Violation of Human Rights and Social work practice: Social Work with the Victims of Human Rights Violations and Human Rights Activism. Role of UNHCR, National Human Rights Commission and International Human Rights Agencies.

UNIT V

Areas of Social Work Practice I

(Health Care Social Work Practice, Social Work with Older Persons and Personswith Disabilities, Gender, Labour Welfare, Industrial Relations, Personnel Management and Human Resource Management)

- **Medical Social Work and Psychiatric Social Work:** Concept, Evolution, Roles, Functions / Responsibilities of Medical Social Workers and Psychiatric Social Workers.
- **Mental Health and Disease:** Normal and abnormal behaviour, Epidemiology, Etiology, Types, Clinical Manifestation and Management of Schizophrenia, Mood Disorders, Neurotic Disorders, stress related Disorders, Somatoform Disorders, Child and Adolescent Mental Health Problems, Legislations related to Mental Health.
- **Theories of Aging and Vulnerability:** Psychological and Sociological Theories of Aging, Psychological, Social, Physical needs and problems of Older Persons. Rights of Older Persons against Neglect, Abuse, Violence and Abandonment and Social Work Interventions.
- **Persons with Disabilities:** Models of Disability, Disability Movement– Historical Perspective, National and International Milestones from Welfare to Right based Approach, Legislative Measures and Social Work Interventions.
- **Gender and Development:** Expressions of Gender Disparity in Education, Health, Property, Employment and Livelihood, Decision Making, Feminization of Poverty and Manifestations of Gender based Violence. Constitutional & Legislative Safeguards and Social work Interventions.
- **Labour Welfare & Human Resource Management (HRM):** Historical background of Industrial Development as a sub-system of society, Concept of Labour Welfare, Nature, Objectives, Principles, Theories, Principles of labour welfare, Labour Legislations, Human Resource management : Concept, Scope, Evolution, Theories, Models, Sub-systems, Human Resources Development (HRD) - Performance Management System, Types, Six Sigma, ISO, Total Quality Management, Corporate Social Responsibility(CSR) - Concept, Issues, Practices, Models, Components, Approaches and Corporate Governance.
- **Personnel Management and Industrial Relations:** Concept, Definition, Objectives, Scope., Functions, Determinants and Reflectors of Industrial Relations, Models of Industrial Relations, Globalization and Industry, International Labour Organization(ILO) Role, Functions; Collective Bargaining, Job Analysis, Manpower Planning, Organization Behaviour and Organization Development Interventions.

Areas of Social Work Practice II

(Social Defence and Correctional Services, Social Work with Families and Children, Environment and Social Work, Social Work and Disaster Management)

- **Social Defence:** Concept, Philosophy and Changing Dimensions, Children in Need of Care and Protection, Juveniles in Conflict with law, Street and Working Children and Young Offenders, Probation and Parole. Emerging issues in Social Defence.
- **Legislation and Criminal Justice System:** Juvenile Justice (Care and Protection of Children) Act, 2000, Immoral Traffic prevention Act 1986, Probation of Offenders Act, 1958, Beggary Prevention Act, Narcotic Drugs and Psychotropic Substance Act 1986, Prison Act, and Criminal Justice System.
- **Social Work with Families:** Functions, Developmental Stages and Family patterns, Family Dynamics and Theoretical Models of Family Functioning (Circumflex model, Mc Master Model and Structural Model) and Social Work Interventions.
- **Child Development:** Concept, Philosophy and Historical context, State of Children in India - Demographic Profile, Education, and Protection
- **Policies & Programmes for Children:** Constitutional provisions, National Policy on Children, International perspective and UN convention on rights of children, Programmes and Legislative Measures related to Female Feticide, Adoption, Foster Care, Guardianship and Child Marriage and Social Work Interventions.
- **Environment and Social Work:** Causes and Consequences, Differential impact on Women, Poor, Marginalised Groups and Indigenous Populations. Environment in the Human Rights Perspective. Environmental Movements and social work interventions in the management, protection and promotion of the environment.
- **Social Work and Disaster Management:** Disaster related concept and Definitions: Hazard, Risk, Vulnerability and Disaster, different forms of natural & manmade disasters. Impact of Disaster and Disaster Management Initiatives, Pre and Post Disaster Interventions.

CMRF**Eligibility Test****Subject: Public Administration****Code No: A08****Unit-I**

Introduction to Public Administration: Public Administration- Meaning, Nature, Scope & Significance; Evolution and Present Status of the Discipline; Politics- Administration Dichotomy; Globalization and Public Administration; Paradigm shift from Government to Governance.

Principles of Organization: Division of work; Hierarchy; Coordination; Unity of Command; Span of Control; Authority, Power and Responsibility; Delegation, Centralization and Decentralization; Line, Staff and Auxiliary Agencies; Leadership and Supervision; Decision-making and Communication.

Meaning, Nature and Scope of Personnel Administration: Classification, Recruitment, Training, Promotion, Compensation and service conditions, Discipline, Civil Service Neutrality, Anonymity and Commitment, Professional Associations and Unionism.

Administrative Thought: Approaches to the study of Public Administration: Oriental – Kautilya; Classical – F W Taylor, Henri Fayol, Max Weber, Luther Gulick and Lyndall Urwick ; Human Relations - Elton Mayo, Mary Parker Follett; Behaviouralism– Chester Barnard, Herbert Simon; Motivation – Abraham Maslow, Fredrick Herzberg, Douglas McGregor; Organizational Humanism – Chris Argyris, Rensis Likert; Writers on Administration: Dwight Waldo, Ferrel Heady, Robert Golembiewski and Peter Drucker; Minnbrook Perspective, New Public Service and Post Modernism.

Unit-II

Indian Administration: Evolution - Ancient, Mughal and British Periods; Constitutional Framework: Parliamentary and Federal Features.

Union Government: President; Prime Minister & Council of Ministers; Cabinet Committees; Central Secretariat; Cabinet Secretariat; and Prime Minister Office. Election Commission and Electoral Reforms, Union State Relations.

Accountability: Legislative; Executive; and Judicial.

Citizen Grievance Redressal Mechanism: Lok Pal; Lok Ayukta; Central Vigilance Commission and Regulatory Authorities. Issue Areas: Politician and Civil Servant relations, Generalists and Specialists debate and Combating Corruption.

Civil Services: Classification – All India Services, Central Services and State Services; Recruitment Agencies – Union Public Service Commission, State Public Service Commissions and other Commissions and Boards: Capacity Building of Civil Servants and Civil Service Reforms.

Planning: Planning Commission, National Development Council, NITI Aayog, State Planning Commissions / Boards and Planning Departments.

Judiciary: Indian Constitution and Independence of Judiciary: Supreme Court; High Courts; Judicial Review and Public Interest Litigation and Judicial Reforms. Police Administration and Reforms. E- Governance Initiatives in Indian administration.

State & Local Administration: Constitutional Framework of State Administration – State Legislature; Governor – Role and Functions; Chief Minister – Powers and Functions; Council of Ministers; Role and Functions of Chief Secretary; State Secretariat ; Directorates and Commissionerate; District Administration – Concept and Evolution, District Collector - Power, Functions and Changing role; Autonomous District Councils - Structure, Powers and Functions, District Rural Development Agency; Evolution of Local Governance in India.

Local Governance: 73rd & 74th Constitutional Amendment Acts: State Election Commission; State Finance Commission; District Planning Committee; Rural Governance - Gram Sabha, Gram Panchayats, Panchayat Samitis and Zila Parishads, Finance in PRIs, Personnel administration at local level; Policies and Programmes of Rural Development – MGNREGA.

Growth of Urbanization, Urban Governance - Structure, Composition, Functions of Municipal Corporations, Municipal Councils, Nagar Panchayats and Metropolitan Governance - Sources of Finance; Personnel Administration. Reforms in Urban Governance -Solid Waste Management, Smart and AMRUT cities.

Unit-III

Comparative and Development Administration: Comparative Public Administration: Concept, Nature, Scope and Significance of Comparative Public Administration; Public Administration and its Environment. Approaches and Methods to the study of Comparative Administration: Institutional, Behavioural, Structural-Functional, Ecological and Systems Approaches. Fred Riggs's Typology of Societies and Features; Problems of Comparative Research; Comparative Studies –Influence of Globalization; Salient Features of the administrative systems of UK, USA, France and Japan.

Development Administration: Development and its Dimensions. Development and Modernization; Approaches to Development - Sustainable Development and Anti- Development; Sustainable Development Goals (SDGs).

Development Administration: Concept, Nature, Scope, Objectives, Features and Significance; Ecology of Development Administration, Contribution of Fred Riggs, Dwight Waldo and Edward Widener; Role of Bureaucracy in Development. Globalization and Development Administration; Emergence of Non-State actors in Development Administration; Public-Private Partnerships; Corporate Social Responsibility, Human Development Indicators and Social Audit.

Economic and Financial Administration: Economic Policies - Mixed Economy Liberalization, Privatization and Globalization (LPG); New Economic Policy (NEP);

Industrial Policy since Independence; Government in Business - Public Enterprises- Concept, Growth and Forms of Public Enterprises; Management, Problem of Accountability and Autonomy; Disinvestment Policies.

Financial Administration: Public Finance – Revenue and Expenditure: Nature, Scope and Significance of Financial Administration; Budget – Meaning, Purpose and Significance; Budgetary Process – preparation, enactment and execution; Types of Budget – PPBS, Performance Budget, Zero-Based Budget and Gender Budget; Fiscal Responsibility and Budget Management Act (FRBMA) and Sunset legislation. Fiscal Federalism – Union-State Financial Relations, Finance Commission. Financial Control- Legislature and Executive; Parliamentary Committees and Comptroller and Auditor General of India. Taxation policies – Principles of Taxation –Progressive and Proportional taxation – Reforms in Taxation policies.

Unit-IV

Social Welfare Administration: Concept of Social Welfare, Social Justice and Social Change; Concept of Equity and Inclusiveness in Social Justice; Concept of Affirmative action-Reservations; Institutional arrangement for Social Welfare & Social Justice Administration; NGOs, Civil Societies and Voluntary Agencies; Policies, Programmes and Institutional Framework for the Protection and Welfare of SCs/ STs / OBCs/ Women/ Children, Aged, Differently-abled (Divyang) and Minorities Commissions – Women, SC/ST, Minority- Role and Functions.

Disaster Management - Nature and Types of Disaster; Institutional Arrangements for Disaster Management; Role of State and Non-State actors.

Public Policy: Nature, Scope and Importance of Public Policy; Evolution of Public Policy and Policy Sciences; Public Policy and Public Administration. Approaches to Public Policy – Process Approach, Logical Positivism, Phenomenological Approach, Participatory and Normative Approaches.

Theories and Models of Policy Making – Harold Lasswell, Charles Lindblom, Yehezkel Dror .

Institutions of Policy Making - Legislature, Executive and Judiciary. Types of Policy Analysis - Empirical, Normative, Retrospective and Prospective, Prescriptive and Descriptive. Policy Implementation, Outcomes and Evaluation.

Constraints on Public Policy – Socio-economic, Political, Institutional and Cultural. Role of Media, Public Opinion, Civil Society and Pressure Groups on Policy Making.

Unit-V

Governance and Good Governance: Ancient Discourse – Kautilya, Plato and Aristotle on Good Governance; Elements and Forms of Good Governance; Theories and Concepts of Governance – World Bank and UNDP; State, Market and Civil Society, Public Choice Theory, New Public Management, Public Value Theory, Governance as Theory, Governance and Public Governance.

Networking and Collaborative Governance, Business Process Re-engineering, ICT and Governance – e-Government and e-Governance, e-Readiness and Digital Divide.

Accountability, Openness and Transparency; Gender and Governance.

Citizen and Governance: Civil Society – Role and Limitations, Citizen Participation, Right to Information – RTI Act and Administrative Reforms, National Information Commission, Citizen Charter – Concept, Objectives and Significance.

Ethics and Public Accountability in Governance: Rule of Law and Administrative Law, Delegated Legislation and Administrative Adjudication. Ethical Foundations of Governance: Constitutional Values, Family, Society and Education.

Research Methodology: Social Science Research- Meaning and Significance; Distinction between Methodology and Method; Facts and Values in Research; Role of Research in Theory-Building; Scientific Method; Objectivity in Social Research; Types of Research; Identification of Research Problem; Hypotheses and Null- Hypotheses; Validation of Hypothesis; Research Design; Methods of Data Collection- Primary and Secondary sources- (Observation; Questionnaire and Interview, Use of Library and Internet); Sampling and Sampling Techniques; Scales of Measurement; Analysis of Data and Use of Computers in Social Science Research- SPSS; Citation patterns and Ethics of Research ; Bibliography; Report Writing.

CMRF**SYLLABUS****BUSINESS MANAGEMENT & BUSINESS ADMINISTRATION****CODE No: A09****UNIT I**

Evolution of management thought : Systems and contingency approach for understanding organizations; Managerial processes, functions, skills and roles in an organization; Social Responsibility of Business; Understanding and Managing individual behaviour; Personality; Perceptions; Attitudes; Learning; Decision-making; Management by Objectives; Understanding and managing group processes- interpersonal and group dynamics; Applications of Emotional Intelligence in organizations. Leadership and influence process; Work Motivation. Understanding and Managing organizational system—Organizational design and structure, Work stress, Organizational Change and development; Conflict Management; Stress Management.

Nature, components and determinants of business environment, dynamics of business environment, key indicators; Risk in business environment, Assessing business environment -country risk and political risk. Current state of business environment in India Economic reforms - Liberalization, privatization, globalization, industrial policy and industrialization trends, public enterprise reforms and disinvestment programme; competitive environment; financial environment. India's current balance of payment position, globalization trends, Trade reforms & trends, FDI policy & trends, India's share in world economy. Trends in global trade & investment; Nature & operations of multilateral economic institutions- World Bank, WTO IMF and their impact on Indian business environment. Factors of global competitiveness. Strategic management process and Evaluation.

UNIT II

Accounting Principles and Standards, Preparation of Financial Statements; Financial Statement Analysis – Ratio Analysis, Funds Flow and Cash Flow Analysis, DuPont Analysis; Preparation of Cost Sheet, Marginal Costing, Cost Volume Profit Analysis Standard Costing & Variance Analysis; Financial Management, Concept & Functions; Capital Structure – Theories, Cost of Capital, Sources and Finance Budgeting and Budgetary Control, Types and Process, Zero base Budgeting; Leverages– Operating, Financial and Combined Leverages, EBIT–EPS Analysis, Financial Break even Point & Indifference Level.

Value & Returns – Time Preference for Money, Valuation of Bonds and Shares, Risk and Returns; Capital Budgeting – Nature of Investment, Evaluation, Comparison of Methods; Risk and Uncertainty Analysis Dividend – Theories and Determination ; Mergers and Acquisition – Corporate Restructuring, Value Creation, Merger Negotiations, Leveraged Buyouts, Takeover; Portfolio Management – CAPM, APT

Derivatives – Options, Option Payoffs, Option Pricing, Forward Contracts & Future Contracts; Working Capital Management – Determinants, Cash, Inventory, Receivables and Payables Management, Factoring; International Financial Management, Foreign exchange market.

UNIT III

Nature, scope and concept of marketing, Corporate orientations towards the market place; The Marketing environment and Environment scanning; Marketing information system and Marketing research; Understanding consumer and Industrial markets; Market segmentation, Targeting and positioning; Product decisions —product mix, product life cycle, new product development, branding and packaging decisions; Pricing methods and strategies; Promotion decisions—promotion mix, advertising, sales promotion, publicity and personal selling; Channel management - Evaluation and control of marketing efforts; Ethics in Marketing; New issues in marketing - Globalization, Consumerism, Green Marketing, Direct Marketing, Network Marketing, Event Marketing.

Concepts and Perspectives on Human Resource Management; Human Resources Management in a changing environment; Corporate objectives and Human Resource Planning; Career and succession planning; job analysis; Methods of manpower search; Attracting, Selecting and retaining human resources; Induction and socialization; Manpower training and development; Performance appraisal and potential evaluation; Job evaluation and compensation; Employee welfare; Industrial relations & trade unions; Dispute resolution & grievance management, Employee empowerment.

UNIT IV

Nature and Scope of Production and Operations Management; Facility Location; Types of Manufacturing Systems and Layouts; Layout Planning and Analysis; Material Handling : Principles & Equipments; Line Balancing; Production Planning and Control in Mass Production, in Batch and Job Order manufacturing; Capacity Planning; Product Planning and Selection, Process Planning, Aggregate Planning and Master Production Scheduling; Maintenance Management, Work Study : Method Study and Work Measurement, Material Management, Material Management; An Overview of Material Management, Material Requirement Planning and Inventory Control; JIT; Purchase Management; Stores Management; Quality Assurance : Acceptance Sampling, Statistical Quality Control, Total Quality Management.

Computers: An introduction; Computers in business; Elements of computer system set-up; Indian computing environment; components of a computer system; Software Packages - An Introduction - Disk Operating System and Windows; Introduction to Word Processor. Introduction to a spreadsheet software; Creation of spreadsheet applications; Range, Formulas, Functions, Data Base Functions in spreadsheet; Graphics on Spreadsheet; Data Files- Types/Organization; Master & Transaction File; Relevance of Data Base Management; Systems and Integration of Applications; Basics of Data Processing; Data Hierarchy & Data File Structures. Network Fundamentals, Analog and Digital Signals, Band width, Network Topology, Network Applications.

UNIT V

Significance of Entrepreneur in Economic Development; Economic, Social and psychological need for entrepreneurship; Characteristics, qualities and pre – requisites of entrepreneur; The function of the entrepreneur in economic development of a Country; Methods and procedures to start and expand one's own business; Life cycle of new business and relationship with large enterprises; Achievement motivation; Environmental Factors affecting success of a new business; Reasons for the failure and visible problems for business-Feasibility Study –Preparation of Feasibility Reports : Selection of factory location, Demand Analysis, Market potential measurement, Capital saving and project costing, Working capital requirements, profit and tax planning; Economic, Technical, Financial and Managerial Feasibility of Project. Govt. support to new enterprise; Incentives; source of Finance; Role of Govt. and Promotional agencies in entrepreneurship development. Nature and Scope of Research Methodology Problem Formulation and Statement of Research Objectives; Value and Cost of Information; Bayesian Decision Theory; Research Process; Research Designs - Exploratory, Descriptive and Experimental; Methods of Data Collection— Observational and Survey Methods; Questionnaire and Interviews. Attitude Measurement Techniques; Administration of Surveys; Sample Design; Selecting an Appropriate Statistical Technique. Field Work and Tabulation of Data; Analysis of Data.

CMRF**SYLLABUS****Subject: ECONOMICS****Code No: A10****Unit-I****Micro Economics**

- Theory of Consumer Behaviour
- Theory of Production and Costs
- Decision making under uncertainty Attitude towards Risk
- Game Theory – Non Cooperative games
- Market Structures, competitive and non-competitive equilibria and their efficiency properties
- Factor Pricing
- General Equilibrium Analysis
- Efficiency Criteria: Pareto-Optimality, Kaldor – Hicks and Wealth Maximization
- Welfare Economics: Fundamental Theorems , Social Welfare Function
- Asymmetric Information: Adverse Selection and Moral Hazard

Macro Economics

- National Income: Concepts and Measurement
- Determination of output and employment: Classical & Keynesian Approach
- Consumption Function
- Investment Function
- Multiplier and Accelerator
- Demand for Money
- Supply of Money
- IS – LM Model Approach
- Inflation and Phillips Curve Analysis
- Business Cycles
- Monetary and Fiscal Policy
- Rational Expectation Hypothesis and its critique

Unit- II**Statistics and Econometrics**

- Probability Theory: Concepts of probability, Distributions, Moments, Central Limit theorem
- Descriptive Statistics – Measures of Central tendency & dispersions, Correlation, Index Numbers
- Sampling methods & Sampling Distribution
- Statistical Inferences, Hypothesis testing
- Linear Regression Models and their properties – BLUE

- Identification Problem
- Simultaneous Equation Models – recursive and non-recursive
- Discrete choice models
- Time Series Analysis

Mathematical Economics

- Sets, functions and continuity, sequence, series
- Differential Calculus and its Applications
- Linear Algebra – Matrices, Vector Spaces
- Static Optimization Problems and their applications
- Input-Output Model, Linear Programming
- Difference and Differential equations with applications

Unit-III**International Economics**

- International Trade: Basic concepts and analytical tools
- Theories of International Trade
- International Trade under imperfect competition
- Balance of Payments: Composition, Equilibrium and Disequilibrium and Adjustment Mechanisms
- Exchange Rate: Concepts and Theories
- Foreign Exchange Market and Arbitrage
- Gains from Trade, Terms of Trade, Trade Multiplier
- Tariff and Non-Tariff barriers to trade; Dumping
- GATT, WTO and Regional Trade Blocks; Trade Policy Issues
- IMF & World Bank

Public Economics

- Market Failure and Remedial Measures: Asymmetric Information, Public Goods, Externality
- Regulation of Market – Collusion and Consumers' Welfare
- Public Revenue: Tax & Non-Tax Revenue, Direct & Indirect Taxes, Progressive and non-Progressive Taxation, Incidence and Effects of Taxation
- Public expenditure
- Public Debt and its management
- Public Budget and Budget Multiplier
- Fiscal Policy and its implications

Unit-IV**Money and Banking**

- Components of Money Supply
- Central Bank

- Commercial Banking
- Instruments and Working of Monetary Policy
- Non-banking Financial Institutions
- Capital Market and its Regulation

Growth and Development Economics

- Economic Growth and Economic Development
- Theories of Economic Development: Adam Smith, Ricardo, Marx, Schumpeter, Rostow, Balanced & Unbalanced growth, Big Push approach.
- Models of Economic Growth: Harrod-Domar, Solow, Robinson, Kaldor
- Technical progress – Disembodied & embodied; endogenous growth
- Indicators of Economic Development: PQLI, HDI, SDGs
- Poverty and Inequalities – Concepts and Measurement
- Social Sector Development: Health, Education, Gender

Unit-V

Environmental Economics and Demography

- Environment as a Public Good
- Market Failure
- Coase Theorem
- Cost-Benefit Analysis and Compensation Criteria
- Valuation of Environmental Goods
- Theories of Population
- Concepts and Measures: Fertility, Morbidity, Mortality
- Age Structure, Demographic Dividend
- Life Table
- Migration

Indian Economy

- Economic Growth in India: Pattern and Structure
- Agriculture: Pattern & Structure of Growth, Major Challenges, Policy

Responses

- Industry: Pattern & Structure of Growth, Major Challenges, Policy Responses
- Services: Pattern & Structure of Growth, Major Challenges, Policy Responses
- Rural Development – Issues, Challenges & Policy Responses
- Urban Development – Issues, Challenges and Policy Responses.
- Foreign Trade: Structure and Direction, BOP, Flow of Foreign Capital, Trade Policies
- Infrastructure Development: Physical and Social; Public-Private Partnerships
- Reforms in Land, Labour and Capital Markets
- Centre-State Financial Relations and Finance Commissions of India; FRBM
- Poverty, Inequality & Unemployment

CMRF**Subject: Commerce****Code No: A11****Unit I: Business Environment and International Business**

- Concepts and elements of business environment: Economic environment- Economic systems, Economic policies (Monetary and fiscal policies); Political environment- Role of government in business; Legal environment- Consumer Protection Act, FEMA; Socio-cultural factors and their influence on business; Corporate Social Responsibility (CSR)
- Scope and importance of international business; Globalization and its drivers; Modes of entry into international business
- Theories of international trade; Government intervention in international trade; Tariff and non-tariff barriers; India's foreign trade policy
- Foreign direct investment (FDI) and Foreign portfolio investment (FPI); Types of FDI, Costs and benefits of FDI to home and host countries; Trends in FDI; India's FDI policy
- Balance of payments (BOP): Importance and components of BOP
- Regional Economic Integration: Levels of Regional Economic Integration; Trade creation and diversion effects; Regional Trade Agreements: European Union (EU), ASEAN, SAARC, NAFTA
- International Economic institutions: IMF, World Bank, UNCTAD
- World Trade Organisation (WTO): Functions and objectives of WTO; Agriculture Agreement; GATS; TRIPS; TRIMS

Accounting and Auditing

- Basic accounting principles; concepts and postulates
- Partnership Accounts: Admission, Retirement, Death, Dissolution and Insolvency of partnership firms
- Corporate Accounting: Issue, forfeiture and reissue of shares; Liquidation of companies; Acquisition, merger, amalgamation and reconstruction of companies
- Holding company accounts
- Cost and Management Accounting: Marginal costing and Break-even analysis; Standard costing; Budgetary control; Process costing; Activity Based Costing (ABC); Costing for decision-making; Life cycle costing, Target costing, Kaizen costing and JIT
- Financial Statements Analysis: Ratio analysis; Funds flow Analysis; Cash flow analysis
- Human Resources Accounting; Inflation Accounting; Environmental Accounting
- Indian Accounting Standards and IFRS
- Auditing: Independent financial audit; Vouching; Verification and valuation of assets and liabilities; Audit of financial statements and audit report; Cost audit
- Recent Trends in Auditing: Management audit; Energy audit; Environment audit; Systems audit; Safety audit

Unit II: Business Economics

- Meaning and scope of business economics
- Objectives of business firms
- Demand analysis: Law of demand; Elasticity of demand and its measurement; Relationship between AR and MR
- Consumer behavior: Utility analysis; Indifference curve analysis

- Law of Variable Proportions: Law of Returns to Scale
- Theory of cost: Short-run and long-run cost curves
- Price determination under different market forms: Perfect competition; Monopolistic competition; Oligopoly-Price leadership model; Monopoly; Price discrimination
- Pricing strategies: Price skimming; Price penetration; Peak load pricing

Business Finance

- Scope and sources of finance; Lease financing
- Cost of capital and time value of money
- Capital structure
- Capital budgeting decisions: Conventional and scientific techniques of capital budgeting analysis
- Working capital management; Dividend decision: Theories and policies
- Risk and return analysis; Asset securitization
- International monetary system
- Foreign exchange market; Exchange rate risk and hedging techniques
- International financial markets and instruments: Euro currency; GDRs; ADRs
- International arbitrage; Multinational capital budgeting

Unit III: Business Statistics and Research Methods

- Measures of central tendency
- Measures of dispersion
- Measures of skewness
- Correlation and regression of two variables
- Probability: Approaches to probability; Bayes' theorem
- Probability distributions: Binomial, poisson and normal distributions
- Research: Concept and types; Research designs
- Data: Collection and classification of data
- Sampling and estimation: Concepts; Methods of sampling - probability and non- probability methods; Sampling distribution; Central limit theorem; Standard error; Statistical estimation
- Hypothesis testing: z-test; t-test; ANOVA; Chi-square test; Mann-Whitney test (U- test); Kruskal-Wallis test (H-test); Rank correlation test
- Report writing

Business Management and Human Resource Management

- Principles and functions of management
- Organization structure: Formal and informal organizations; Span of control
- Responsibility and authority: Delegation of authority and decentralization
- Motivation and leadership: Concept and theories
- Corporate governance and business ethics
- Human resource management: Concept, role and functions of HRM; Human resource planning; Recruitment and selection; Training and development; Succession planning

- Compensation management: Job evaluation; Incentives and fringe benefits
- Performance appraisal including 360 degree performance appraisal
- Collective bargaining and workers' participation in management
- Personality: Perception; Attitudes; Emotions; Group dynamics; Power and politics; Conflict and negotiation; Stress management
- Organizational Culture: Organizational development and organizational change

Unit IV: Banking and Financial Institutions

- Overview of Indian financial system
- Types of banks: Commercial banks; Regional Rural Banks (RRBs); Foreign banks; Cooperative banks
- Reserve Bank of India: Functions; Role and monetary policy management
- Banking sector reforms in India: Basel norms; Risk management; NPA management
- Financial markets: Money market; Capital market; Government securities market
- Financial Institutions: Development Finance Institutions (DFIs); Non-Banking Financial Companies (NBFCs); Mutual Funds; Pension Funds
- Financial Regulators in India
- Financial sector reforms including financial inclusion
- Digitisation of banking and other financial services: Internet banking; mobile banking; Digital payments systems
- Insurance: Types of insurance- Life and Non-life insurance; Risk classification and management; Factors limiting the insurability of risk; Re-insurance; Regulatory framework of insurance- IRDA and its role

Marketing Management

- Marketing: Concept and approaches; Marketing channels; Marketing mix; Strategic marketing planning; Market segmentation, targeting and positioning
- Product decisions: Concept; Product line; Product mix decisions; Product life cycle; New product development
- Pricing decisions: Factors affecting price determination; Pricing policies and strategies
- Promotion decisions: Role of promotion in marketing; Promotion methods - Advertising; Personal selling; Publicity; Sales promotion tools and techniques; Promotion mix
- Distribution decisions: Channels of distribution; Channel management
- Consumer Behaviour; Consumer buying process; factors influencing consumer buying decisions
- Service marketing
- Trends in marketing: Social marketing; Online marketing; Green marketing; Direct marketing; Rural marketing; CRM
- Logistics management

Unit V: Legal Aspects of Business

- Indian Contract Act, 1872: Elements of a valid contract; Capacity of parties; Free consent; Discharge of a contract; Breach of contract and remedies against breach; Quasi contracts;
- Special contracts: Contracts of indemnity and guarantee; contracts of bailment and pledge; Contracts of agency
- Sale of Goods Act, 1930: Sale and agreement to sell; Doctrine of Caveat Emptor; Rights of unpaid seller and rights of buyer

- Negotiable Instruments Act, 1881: Types of negotiable instruments; Negotiation and assignment; Dishonour and discharge of negotiable instruments
- The Companies Act, 2013: Nature and kinds of companies; Company formation; Management, meetings and winding up of a joint stock company
- Limited Liability Partnership: Structure and procedure of formation of LLP in India
- The Competition Act, 2002: Objectives and main provisions
- The Information Technology Act, 2000: Objectives and main provisions; Cyber crimes and penalties
- The RTI Act, 2005: Objectives and main provisions
- Intellectual Property Rights (IPRs) : Patents, trademarks and copyrights; Emerging issues in intellectual property
- Goods and Services Tax (GST): Objectives and main provisions; Benefits of GST; Implementation mechanism; Working of dual GST

Income-tax and Corporate Tax Planning

- Income-tax: Basic concepts; Residential status and tax incidence; Exempted incomes; Agricultural income; Computation of taxable income under various heads; Deductions from Gross total income; Assessment of Individuals; Clubbing of incomes
- International Taxation: Double taxation and its avoidance mechanism; Transfer pricing
- Corporate Tax Planning: Concepts and significance of corporate tax planning; Tax avoidance versus tax evasion; Techniques of corporate tax planning; Tax considerations in specific business situations: Make or buy decisions; Own or lease an asset; Retain; Renewal or replacement of asset; Shut down or continue operations
- Deduction and collection of tax at source; Advance payment of tax; E-filing of income-tax returns
- Income-tax: Basic concepts - Residential status and tax incidence - Exempted incomes; Agricultural income - Computation of taxable income under Salaries, House property, Capital gains, Profits and gains of business and profession and Income from other sources – Gross total income – Deductions from Gross total income - Clubbing of incomes - Set off and carry forward of losses - Assessment of Individuals
- Deduction and collection of tax at source - Advance payment of tax - E-filing of income-tax returns
- Tax planning, Tax avoidance and Tax evasion – Techniques of corporate tax planning and specific management decisions: Make or buy, Own or lease, Retain or replace, Shut down or continue.
- International Taxation: Transfer pricing and anti-avoidance measures – Non-resident taxation – Double taxation relief – Application and interpretation of tax treaties

CMRF**State Eligibility Test****Subject: Library and Information Science****Code No: A12****Unit – I**

- Data, Information, Knowledge and Wisdom.
- Information Life Cycle - Generation, Collection, Storage and Dissemination.
- Role of Information in Planning, Management, Socio-economic, Cultural, Educational and Technological Development.
- Information Science - Relationship with other subjects, Information Society and Knowledge Society.
- Communication – Concept, Types, Theories, Models, Channels and Barriers; Trends in Scholarly Communication.
- Information Industry - Generators, Providers and Intermediaries.
- IPR and Legal Issues - Categories, Conventions, Treaties, Laws.
- Plagiarism: Concept and Types.
- Right to Information Act (RTI); Information Technology Act.
- National Knowledge Commission; National Mission on Libraries.
- Historical Development of Libraries in India; Committees and Commissions on Libraries in India.
- Types of Libraries – Academic, Public, Special and National.
- Library Legislation and Library Acts in Indian States; The Press and Registration of Books Act; The Delivery of Books and Newspapers (Public Libraries) Act.
- Laws of Library Science.
- Library and Information Science Profession - Librarianship as a Profession, Professional Skills and Competences; Professional Ethics.
- Professional Associations - National – ILA, IASLIC, IATLIS; International – IFLA, ALA, CILIP, ASLIB, SLA; Role of UGC, RRRLF and UNESCO in Promotion and Development of Libraries.
- Library and Information Science Education in India.
- Library Public Relations and Extension Activities.
- Type of Users - User Studies, User Education.
- Information Literacy - Areas, Standards, Types and Models; Trends in Information Literacy.

Unit – II

- Information Sources - Nature, Characteristics, Types and Formats.
- Sources of Information - Primary, Secondary and Tertiary; Documentary and Non-Documentary.
- Primary Information Sources (Print and Electronic) - Journals, Conference Proceedings, Patents, Standards, Theses & Dissertations, Trade Literature.
- Secondary Information Sources (Print and Electronic) - Dictionaries, Encyclopedias, Bibliographies, Indexing & Abstracting, Statistical sources, Handbooks and Manuals.
- Tertiary Information Sources (Print and Electronic)- Directories, Year Books, Almanacs.
- Reference Sources - Bibliographical, Biographical, Educational, Language and Geographical.

- Electronic Information Resources - Subject Gateways, Web Portals, Bulletin Boards, Discussion Forums / Groups.
- Databases: Bibliographic, Numeric, Full text, Multimedia; Open Access Databases.
- Institutional and Human Resources.
- Evaluation of Reference Sources and Web Resources.

- Community Information Services.
- Reference Service – Concept and Types; Referral Services
- Alerting Services - CAS, SDI, Inter Library Loan and Document Delivery.
- Mobile based Library Services and Tools – Mobile OPAC, Mobile Databases, Mobile Library Website, Library Apps, Mobile Library Instructions, Augmented Reality, SMS Alerts, Geo-Location, Reference Enquiry.
- Web 2.0 and 3.0 - Library 2.0- Concept, Characteristics, Components; Instant Messaging, RSS Feeds, Podcasts, Vodcasts, Ask a Librarian
- Collaborative Services- Social Networks, Academics Social Networks, SocialTagging, Social Bookmarking.
- Web – Scale Discovery Services
- National Information Systems and Networks: NISCAIR, DESIDOC, SENDOC, ENVIS, INFLIBNET, DELNET, NICNET, ERNET, National Knowledge Network (NKN), Biotechnology Information System Network
- International Information Systems and Networks: INIS, AGRIS, INSPEC, MEDLARS, BIOSIS, ERIC, Patent Information System (PIS), Biotechnology Information System (BIS).
- Library Resource Sharing and Library Consortia – National and International.

Unit - III

- Universe of Knowledge - Nature and Attributes; Modes of Formation of Subjects.
- Knowledge Organisation - Classification – Theories, Canons, and Principles; Simple Knowledge Organisation System (SKOS), Taxonomies, Folksonomy, Trends in Classification.
- Mapping of Subjects in Library Classification Schemes – DDC, UDC and CC.
- Knowledge Organisation: Cataloguing - Canons and Principles; Centralized and Co-operative Catalogue; Library Cataloguing Codes: CCC and AACR - II.
- Standards of Bibliographic Record Formats and Description – ISBD, MARC 21, CCF, RDA, FRBR, Bibframe.
- Standards for Bibliographic Information Interchange & Communication – ISO2709, Z39.50, Z39.71.
- Metadata Standards: Dublin Core; MARC21, METS, MODES, EAD.
- Indexing Systems and Techniques: Assigned - Pre-coordinate; Post-Coordinate; Derived- Title-based; Vocabulary Control.
- Abstracting – Types and Guidelines.
- Information Retrieval System – Features, Components, Models and Evaluation.
- Management - Principles, Functions and Schools of thought.
- Library and Information Centers Management - Book Selection Tools and Principles; Library Acquisition, Technical Processing, Circulation, Serial Control, Maintenance and Stock Verification; Preservation and Conservation; Hazards and Control Measures of Library Materials.

- Human Resource Management – Planning, Job Analysis, Job Description, Job Evaluation, Selection, Recruitment, Motivation, Training and Development, Performance Appraisal; Staff Manual.
- Financial Management in Libraries - Sources of Finance, Resource Mobilisation, Budgeting Methods; Cost Effective and Cost Benefit Analysis, Annual Reports & Statistics; Library Authority and Committee.
- Project Management - SWOT, PEST, PERT / CPM.
- Total Quality Management (TQM) - Concepts, Principles and Techniques, Six Sigma; Evaluation of Services of Libraries and Information Centers.
- Library Building, Furniture and Equipments; Green Library Building; Information Commons; Makers Space; Security and Safety.
- Management Information System (MIS), MBO, Change Management, Disaster Management, Crisis Management.
- Knowledge Management – Principles, Tools, Components and Architecture.
- Marketing of Library Products and Services – Plan, Research, Strategies, Mix, Segmentation, Pricing and Advertising; Management Consultancy.

Unit - IV

- Computer Technology - Character Representation (ASCII, ISCII, Unicode); Computer Hardware, Software; Storage Devices; Input and Output Devices.
- Types of Software - System Software, Application Software.
- Programming Languages – Object Oriented, Procedural, High Level, Scripting; Web Languages.
- Telecommunication - Transmission Channels, Mode, and Media, ISDN, PSDN, Multiplexing, Modulation, Standards and Protocols.
- Wireless Communication – Media, Wi-fi, Li-fi, Satellite Communication, Mobile Communication.
- Computer Networks - Topologies, Types of Networks – LAN, MAN, WAN.
- Internet - Web browsers, WWW, E-mail; Search Engines, Meta and Entity Search engines.
- Internet Protocols and Standards – HTTP, SHTTP, FTP, SMTP, TCP/IP, URI, URL.
- Hypertext, Hypermedia, Multimedia, Video conferencing, Virtual Reality, Augmented Technologies.
- Data Security, Network Security, Firewalls, Cryptographic Techniques, Anti-virus software, Anti-spyware, Intrusion Detection System.
- Library Automation – Areas, Planning, Selection of Hardware and Software, Implementation and Evaluation; Standards for Library Automation.
- Barcode, RFID, QR Code, Biometric, Smartcard: Features and Applications.
- Digitization – Planning, Selection of Materials, Hardware, Software, Process, Issues.
- Digital Library: Genesis, Characteristics, Types, Architecture; Standards, Formats and Protocols, DOI.
- Digital Preservation - Need, Purpose, Standards, Methods, Techniques, Projects (National and International).
- Digital Library Initiatives – National and International.
- Institutional Repositories - Need, Purpose, Types and Tools; Institutional Repositories in India; ROAR, DOAR, SHARPA-ROMIO.
- Content Management Systems – Architecture, Data Integration, CMS Software – Selection, Implementation and Evaluation.

- Application of Artificial Intelligence, Expert Systems and Robotics in Libraries; Social Mobile Analytics Cloud (SMAC); Cloud Computing.
- Ontology – Tools (RDF, RDFS, Potege); Semantic Web, Linked Data, Big Data, Data Mining, Data Harvesting.

Unit – V

- Research - Concept, Purpose, Functions, Scope and Ethics; Types of Research – Basic and Applied, Interdisciplinary and Multidisciplinary.
- Research Methods: Historical, Descriptive, Experimental and Delphi.
- Research Design - Selection of Research Problem, Review of Literature; Formulation of Research Problem; Hypothesis – Formulation, Types and Testing; Sampling Techniques.
- Methods of Data Collection: Questionnaire, Interview, Observation, Library Records, Scales and Checklist.
- Data Analysis and Interpretation - Presentation of Data; Statistical Methods/ Techniques.
- Statistical Packages – Spreadsheet, SPSS, Bibexcel, ‘R’ Statistics.
- Research Report Writing and Citation Tools – Structure, Style, Contents, Guidelines; Style Manuals; Online Citation Tools; Reference Style Management Tools; Anti- plagiarism Tools; Evaluation of Research Report.
- Metric Studies in LIS - Bibliometrics, Scientometric, Webometrics, Altmetrics;
- Impact Factors – Journal, Institutional and Authors; h-Index, g-Index, i10 Index.
- Trends in Library and Information Science Research.
- Academic Library and Information System.
- Public Library and Information System.
- Special Library and Information System.
- Health Science Library and Information System.
- Corporate Library and Information System.
- Agricultural Library and Information System.
- Engineering and Technological Library and Information System.
- Archive, Museums and Oriental Libraries.
- Community Information System.
- Information Services and System for Persons with Disability, Children and Women.

CMRF**Eligibility Test****Subject: PSYCHOLOGY****Code No. A13****SYLLABUS****UNIT I****Emergence of Psychology**

Psychological thought in some major Eastern Systems: Bhagavad Gita, Buddhism, Sufism and Integral Yoga. Academic psychology in India: Pre- independence era; post-independence era; 1970s: The move to addressing social issues; 1980s: Indigenization; 1990s: Paradigmatic concerns, disciplinary identity crisis; 2000s: Emergence of Indian psychology in academia. Issues: The colonial encounter; Post colonialism and psychology; Lack of distinct disciplinary identity.

Western: Greek heritage, medieval period and modern period. Structuralism, Functionalism, Psychoanalytical, Gestalt, Behaviorism, Humanistic- Existential, Trans personal, Cognitive revolution, Multiculturalism. Four founding paths of academic psychology - Wundt, Freud, James, Dilthey. Issues: Crisis in psychology due to strict adherence to experimental- analytical paradigm (logical empiricism). Indic influences on modern psychology.

Essential aspects of knowledge paradigms: Ontology, epistemology, and methodology. Paradigms of Western Psychology: Positivism, Post-Positivism, Critical perspective, Social Constructionism, Existential Phenomenology, and Co-operative Enquiry. Paradigmatic Controversies. Significant Indian paradigms on psychological knowledge: Yoga, Bhagavad Gita, Buddhism, Sufism, and Integral Yoga. Science and spirituality (avidya and vidya). The primacy of self-knowledge in Indian psychology.

Research Methodology and Statistics

Research: Meaning, Purpose, and Dimensions.

Research problems, Variables and Operational Definitions, Hypothesis, Sampling.

Ethics in conducting and reporting research

Paradigms of research: Quantitative, Qualitative, Mixed methods approach Methods of research: Observation, Survey [Interview, Questionnaires], Experimental, Quasi experimental, Field studies, Cross-Cultural Studies, Phenomenology, Grounded theory, Focus groups, Narratives, Case studies, Ethnography

Statistics in Psychology: Measures of Central Tendency and Dispersion. Normal Probability Curve. Parametric [t-test] and Non-parametric tests [Sign Test, Wilcoxon Signed rank test, Mann-Whitney test, Kruskal-Wallis test, Friedman]. Power analysis. Effect size.

Correlational Analysis: Correlation [Product Moment, Rank Order], Partial correlation, multiple correlation.

Special Correlation Methods: Biserial, Point biserial, tetrachoric, phi coefficient.

Regression: Simple linear regression, Multiple regression.

Factor analysis: Assumptions, Methods, Rotation and Interpretation.

Experimental Designs: ANOVA [One-way, Factorial], Randomized Block Designs, Repeated Measures Design, Latin Square, Cohort studies, Time series, MANOVA, ANCOVA. Single-subject designs.

UNIT II**Psychological testing**

Types of tests, Test construction: Item writing, item analysis, Test standardization: Reliability, validity and Norms, Areas of testing: Intelligence, creativity, neuropsychological tests, aptitude, Personality assessment, interest inventories, Attitude scales – Semantic differential, Staples, Likert scale. Computer-based psychological testing, Applications of psychological testing in various settings: Clinical, Organizational and business, Education, Counseling, Military. Career guidance.

Biological basis of behavior

Sensory systems: General and specific sensations, receptors and processes

Neurons: Structure, functions, types, neural impulse, synaptic transmission. Neurotransmitters.

The Central and Peripheral Nervous Systems – Structure and functions. Neuro plasticity.

Methods of Physiological Psychology: Invasive methods – Anatomical methods, degeneration techniques, lesion techniques, chemical methods, micro electrode studies. Non-invasive methods – EEG, Scanning methods.

Muscular and Glandular system: Types and functions Biological basis of Motivation: Hunger, Thirst, Sleep and Sex.

Biological basis of emotion: The Limb system, Hormonal regulation of behavior.

Genetics and behavior: Chromosomal anomalies; Nature-Nurture controversy [Twin studies and adoption studies]

UNIT III**Attention, Perception, Learning, Memory and Forgetting**

Attention: Forms of attention, Models of attention Perception:

Approaches to the Study of Perception: Gestalt and physiological approaches Perceptual Organization: Gestalt, Figure and Ground, Law of Organization Perceptual Constancy: Size, Shape, and Color; Illusions

Perception of Form, Depth and Movement Role of motivation and learning in perception

Signal detection theory: Assumptions and applications

Subliminal perception and related factors, information processing approach to perception, culture and perception, perceptual styles, Pattern recognition, Ecological perspective on perception.

Learning Process:

Fundamental theories: Thorndike, Guthrie, Hull

Classical Conditioning: Procedure, phenomena and related issues Instrumental learning:

Phenomena, Paradigms and theoretical issues; Reinforcement: Basic variables and schedules; Behaviour modification and its applications

Cognitive approaches in learning: Latent learning, observational learning, Verbal learning and Discrimination learning

Recent trends in learning: Neurophysiology of learning

Memory and Forgetting

Memory processes: Encoding, Storage, Retrieval

Stages of memory: Sensory memory, Short-term memory (Working memory), Long-term Memory (Declarative – Episodic and Semantic; Procedural)

Theories of Forgetting: Interference, Retrieval Failure, Decay, Motivated forgetting

Thinking, Intelligence and Creativity

Theoretical perspectives on thought processes: Associationism, Gestalt, Information processing, Feature integration model

Concept formation: Rules, Types, and Strategies; Role of concepts in thinking Types of Reasoning

Language and thought

Problem solving: Type, Strategies, and Obstacles Decision-making: Types and models

Metacognition: Metacognitive knowledge and Metacognitive regulation

Intelligence: Spearman; Thurstone; Jensen; Cattell; Gardner; Stenberg; Goleman; Das, Kar & Parrila

Creativity: Torrance, Getzels & Jackson, Guilford, Wallach & Kogan Relationship between Intelligence and Creativity

UNIT IV**Personality, Motivation, emotion, stress and coping**

Determinants of personality: Biological and socio-cultural

Approaches to the study of personality: Psychoanalytical, Neo-Freudian, Social learning, Trait and Type, Cognitive, Humanistic, Existential, Transpersonal psychology.

Other theories: Rotter's Locus of Control, Seligman's Explanatory styles, Kohlberg's theory of Moral development.

Basic motivational concepts: Instincts, Needs, Drives, Arousal, Incentives, Motivational Cycle.

Approaches to the study of motivation: Psychoanalytical, Ethological, S-R Cognitive, Humanistic Exploratory behavior and curiosity Zuckerman's Sensation seeking Achievement, Affiliation and Power Motivational Competence Self-regulation Flow Emotions: Physiological correlates Theories of emotions: James-Lange, Canon-Bard, Schachter and Singer, Lazarus, Lindsley. Emotion regulation Conflicts: Sources and types Stress and Coping: Concept, Models, Type A, B, C, D behaviors, Stress management strategies [Biofeedback, Music therapy, Breathing exercises, Progressive Muscular Relaxation, Guided Imagery, Mindfulness, Meditation, Yogasana, Stress Inoculation Training].

Social Psychology

Nature, scope and history of social psychology

Traditional theoretical perspectives: Field theory, Cognitive Dissonance, Sociobiology, Psychodynamic Approaches, Social Cognition.

Social perception [Communication, Attributions]; attitude and its change within cultural context; prosocial behavior

Group and Social influence [Social Facilitation; Social loafing]; Social influence [Conformity, Peer Pressure, Persuasion, Compliance, Obedience, Social Power, Reactance]. Aggression. Group dynamics, leadership style and effectiveness. Theories of intergroup relations [Minimal Group Experiment and Social Identity Theory, Relative Deprivation Theory, Realistic Conflict Theory, Balance Theories, Equity Theory, Social Exchange Theory]

Applied social psychology: Health, Environment and Law; Personal space, crowding, and territoriality.

UNIT V**Human Development and Interventions**

Developmental processes: Nature, Principles, Factors in development, Stages of Development. Successful aging.

Theories of development: Psychoanalytical, Behavioristic, and Cognitive Various aspects of development: Sensory-motor, cognitive, language, emotional, social and moral.

Psychopathology: Concept, Mental Status Examination, Classification, Causes

Psychotherapies: Psychoanalysis, Person-centered, Gestalt, Existential, Acceptance Commitment Therapy, Behavior therapy, REBT, CBT, MBCT, Play therapy, Positive psychotherapy, Transactional Analysis, Dialectic behavior therapy, Art therapy, Performing Art Therapy, Family therapy.

Applications of theories of motivation and learning in School Factors in educational achievement

Teacher effectiveness

Guidance in schools: Needs, organizational set up and techniques Counselling: Process, skills, and techniques

Emerging Areas

Issues of Gender, Poverty, Disability, and Migration: Cultural bias and discrimination. Stigma, Marginalization, and Social Suffering; Child Abuse and Domestic violence.

Peace psychology: Violence, non-violence, conflict resolution at macro level, role of media in conflict resolution.

Wellbeing and self-growth: Types of wellbeing [Hedonic and Eudemonic], Character strengths, Resilience and Post-Traumatic Growth.

Health: Health promoting and health compromising behaviors, Life style and Chronic diseases [Diabetes, Hypertension, Coronary Heart Disease], Psychoneuroimmunology [Cancer, HIV/AIDS]

Psychology and technology interface: Digital learning; Digital etiquette: Cyber bullying; Cyber pornography: Consumption, implications; Parental mediation of Digital Usage.

CMRF**MASS COMMUNICATION AND JOURNALISM**

Code No: A14

UNIT I**Introduction to Journalism and Mass Communication**

- Concept of Journalism and mass communication, mass communication in India.
- History, growth and development of print and electronic media. Major landmarks in print and electronic media in Indian languages. Media's role in formulation of states of India.
- Media criticism and media literacy, Press Council and Press Commissions of India, status of journalism and media education in India. Media policies of the Government of India since Independence.
- Models and theories of mass communication, normative theories, administrative and critical traditions in communication, media and journalism studies, communication and theories of socio-cultural, educational and agricultural change. Technological determinism, critique of Marshall McLuhan's views on media and communication and Marxist approaches. Information and knowledge societies.
- Indian traditions and approaches to communication from the Vedic era to the 21st century. Western and Eastern philosophical, ethical and aesthetic perceptions of communication - Aristotle and Plato, Hindu, Buddhist, and Islamic traditions.
- Media and culture - framework for understanding culture in a globalised world. Globalisation with respect to politico-economic & socio-cultural developments in India.

Communication for Development and Social Change

- Concept and definition of development communication, role of media and journalism in society, characteristics of Indian society – demographic and sociological impact of communication, media and journalism. Media and specific audiences.
- Development and social change. Issues and post-colonial conceptions.
- Deconstruction of dominant paradigm of communication and development. Responses and critique of dominant models.
- Corporatisation of development - Corporate Social Responsibility, non-state actors in development, mass campaigns by NGOs, Government of India, international agencies and corporates. Paradigms and discourse of development communication.
- Emergence of global civil societies, public sphere, global communication system - nation state-universal, national communication policies.
- Leading influencers of social reform in India - Raja Rammohan Roy, Pandit Madanmohan Malviya, Bal Gangadhar Tilak, Mahatma Jyotiba Phule, Mahatma Gandhi, Acharya Vinoba Bhave, Dr B. R. Ambedkar, Deendayal Upadhyay, Dr Ram Manohar Lohia etc.

UNIT – II**Reporting and Editing**

- News-concepts, determinants (values), structure and perspectives. Reporting for print, radio, television and digital media. Types of reporting. National and international news agencies and feature syndicates, functions and role.

- Writing for print, electronic and digital news media. Translation and transcreation.
- Editing and presentation techniques for print, television and digital media.
- Journalism as profession, reportage of contemporary issues, ethics of reporting.
- Critique of western news values, effect of new technology on global communication flows.
- Niche Reporting.

Advertising and Marketing Communication

- Definition, concept, functions, types, evolution of advertising, standards and ethics in advertising. Theories and models of communication in advertising.
- Brand management.
- Advertising management - agency-role, structure and function, client-agency relationship, media planning and budgeting.
- Advertising and creativity, language and translation.
- Advertising campaign and marketing.
- Advertising and marketing research.

UNIT – III

Public Relations and Corporate Communication

- Public Relations and Corporate Communication - definition, concept and scope.
- Structure of PR in State, Public, Private and non-government sectors.
- Tools and techniques of PR and Corporate Communication.
- Crisis communication and crisis communication management.
- Ethics of Public Relations.
- International Public Relations, communication audit.

Media Laws and Ethics

- Concept of law and ethics in India and rest of the world.
- The Constitution of India, historical evolution, relevance.
- Concept of freedom of speech and expression in Indian Constitution.
- Defamation, Libel, Slander-IPC 499-502, Sedition IPC 124(A), Contempt of Courts Act 1971, Official Secrets Act 1923, Press and Registration of Books Act 1867, Working Journalists and other Newspaper Employees (Conditions of Service) and Miscellaneous Provisions Act 1955, Wage Boards, Law of Obscenity (Section 292-294 of IPC); the Miller test, the Hicklin test, Indecent Representation of Women (Prohibition) Act 1986, Scheduled Castes and Tribes (Prevention of Atrocities) Act, 1989, Parliamentary Privileges. Famous cases involving journalists and news media organisations.
- Right to Information Act 2005, Copyright Act 1957, Intellectual Property Rights, Cable Television Network (Regulation) Act 1995, Information Technology Act (relevant) 2000 and cyber laws, Cinematograph Act 1952, Film Censorship, Press Council Act as amended from time to time, IPR, ASCI, Drugs and Magic Remedies (Objectionable Advertisements) Act, 1954, Various regulatory bodies for print, TV, Advertising, PR, and Internet.

- Rules, regulations and guidelines for the media as recommended by Press Council of India, Information and Broadcasting ministry and other professional organisations, adversarial role of the media, human rights and media.

UNIT – IV

Media Management and Production

- Definition, concept of media management. Grammar of electronic media.
- Communication design theories and practice.
- Media production techniques – print and electronic.
- Digital media production techniques.
- Economics and commerce of mass media in India.
- Principles and management in media industry post liberalisation.

ICT and Media

- ICT and media - definition, characteristics and role. Effect of computer mediated communication. Impact of ICT on mass media. Digitisation.
- Social networking.
- Economics and commerce of web enabled media.
- Mobile adaption and new generation telephony by media, ethics and new media.
- ICT in education and development in India, online media and e-governance.
- Animation - concepts and techniques.

UNIT- V

Film and Visual Communication

- Film and television theory.
- Film and identity in Indian film studies, leading film directors of India before and after Independence. Indian cinema in the 21st century.
- Approaches to analysis of Indian television.
- Visual Communication. Visual analysis.

- Basics of film language and aesthetics, the dominant film paradigm, evolution of Indian cinema-commercial and 'non-commercial' genres, the Hindi film song, Indian aesthetics and poetics (the theory of Rasa and Dhvani).
- National cinema movements: Soviet Montage cinema, German Expressionistic cinema, Italian Neo-Realistic cinema, French New Wave cinema, British New Wave cinema, Indian New Wave cinema, Period cinema. Cinema in the new millennium.

Communication Research

- Definition, concept, constructs and approaches to communication research process.
- Research Designs - types, structure, components, classical, experimental and quasi experimental, variables and hypotheses; types and methods of research; basic, applied, descriptive, analytical, historical, case study, longitudinal studies.
- Research in journalism, Public Relations, advertising, cinema, animation and graphics, television, Internet, social media practices, magazines, children's media. Communication, journalism and media research in India.
- Levels of measurement: sampling-probability and non-probability, tests of validity and reliability, scaling techniques. Methods and tools of data collection-interviews, surveys, case studies, obtrusive and non-obtrusive techniques, ethnography, schedule, questionnaire, diary, and internet based tools, media specific methods such as exit polls, opinion polls, telephone, SMS surveys and voting with regard to GEC (general entertainment content).
- Data analysis, testing, interpretation, application of statistical tests-parametric and non- parametric, tests of variance-univariate, bivariate and multivariate, tests of significance, computer mediated research.
- Ethical considerations in communication, media and journalism research, writing research reports, plagiarism.

CMRF**Eligibility Exam****Syllabus - Visual Communication****Code: A15**

Unit I : Communication – Definition, Functions, Elements, Models, Types; Human Communication- Verbal and Non-verbal Communication; Barriers of Communication; Visual Communication, Types, Elements, Perception, Illusion, Gestalt’s Theory, Gestalt’s Principles; Visual Analysis – Semiotics – Saussure, Peirce, Barthes; Psychoanalysis - Freud, Lacan, Jung; Feminism – Laura Mulvey; Marxism – Marx, Gramsci, Althusser; Post-modernism – Derrida, Baudrillard

Unit II : Drawing – Principal Elements; RGB, CMYK; Principles of Design and Composition; Iconology, Formalism; Painting Movements; Theories of Rasa; Indian Schools of Art; Design Software – Flash, Dreamweaver, Photoshop, Coreldraw; 2D Animation - Drawing and Painting Tools, Manipulating Objects; 3D Animation – Standard and Extended Primitives, Material Editor, Modifier, Modeling, Special Effect; Matte Extraction, Colour Correction, Rendering, Rotoscopy; VFX Basics, Editing – Types, Using AVID, FCP

Unit III : Photography – Types of Camera, Parts and Functions of Camera, Depth of Field, Aperture, Exposure, Focus, Rule of Third, Golden Mean; Videography – Types of Camera, Camera Shot, Angle, Movement; White Balance, Colour Temperature; Types of Lens, Aspect Ratio, Framing; Editing Techniques – Continuity Editing, Montage, Rules of Editing; Radio and Television Production – Formats, Genres, Three Stages of Production; Podcasting; Scriptwriting – Story, Plot, Treatment, Three-Act Structure, Freytag’s Pyramid, Basic Types of Stories

Unit IV : Audiography – Nature of Sound, Frequency, Wavelength, Amplitude; Acoustic Materials, Echo, Noise Control; Types of Mics, Dubbing, Live Recording, Equalizer, Protocol; Advertising – Definition, Strategies, Unique Selling Proposition, Promotional Mix, Campaign; Copywriting, Event Management, Public Relations; Media Laws and Ethics – Copyrights, Privacy, Slander; Right to Information Act, Prasar Bharati Act, Information Technology Act, Intellectual Property Rights; Censorship Laws, Cyber Laws

Unit V : Film Studies – History of Early Cinema – Lumiere Brothers, Edqin S Porter, George Melies, D W Griffith; German Expressionism, French Impressionism, Surrealism, Soviet Montage Cinema, Hollywood Studios, Italian Neo-realism, French New Wave; Indian Cinema – Early Cinema, Mythologicals, Socials, New Wave, Hindi Cinema; Tamil Cinema – Major Directors, Prominent Films; Documentary; Film Techniques, Genres, Stylistics; Deep Focus Photography, Long Take, One-point Perspective .

CMRF

State Eligibility Test

SYLLABUS

Subject: Physical Education

Code No: A16

Unit -I

Physical education and adapted physical education, their objectives

Philosophies of education as applied to physical education

Development of Physical education in Greece, Rome, Sweden, Russia England, Denmark,

Germany, USA, Australia and China.

Growth and development of physical education in India:

Recreation- its principles, characteristics and importance. Modern trends in recreation. Indoor and outdoor recreational programmes. Recreational programmes for various categories of people.

Wellness- its importance, benefits and challenges. Development and maintenance of wellness.

Teaching Aptitude – nature, objectives, characteristics of teaching, learner characteristics and teaching methods.

Social aspects of sports- sports as a socializing agency, social values, sports leadership, sports as cultural heritage and social aspects of competition.

Ancient & Modern Olympics games, Asian and Commonwealth games.

Structure and functions of international and national bodies controlling various games and sports.

Prominent honours and awards in games and sports.

Exercise physiology its scope and importance in the field of physical education and sports.

Cardio respiratory adaptations to long and short term physical activities.

Muscle- its types, characteristics and functions. Microscopic structure of muscle fibre. Sliding filament theory of muscular contraction. Types of muscle fibres and sports performance.

Muscular adaptations to exercise.

Neuro-muscular junction and transmission of nerve impulse, kinesthetic sense organs and neural control of motor skills.

Bio-chemical aspects of exercise - Metabolism of food products. Aerobic and anaerobic systems during rest and exercise. Direct and indirect methods of measuring energy cost of exercise.

Recovery process - Physiological aspects of fatigue. Restoration of energy stores. Recovery oxygen. Nutritional aspects of performance.

Environmental influence on human physiology under exercise.

Women in sports- trainability. Physiological gender differences and special problems of women athletes.

Aging - Physiological consequences, life style management and healthful aging. Physiological responses of various therapeutic modalities and rehabilitation.

Physiological aspects of various Ergogenic aids. Massage manipulations and their physiological responses.

Unit- II

Kinesiology and biomechanics. Modern trends in biomechanics. Planes and Axes of human body.

Joints and their movements.

Muscle attachments - Origin, insertion, action and leverage of the principal muscles used in sports.

Motion: its laws and their application in sports. Projectile and principles of projections

Linear and angular kinematics and kinetics.

Friction, Spin, impact and elasticity.

Air and water dynamics.

Mechanical advantage and applications of Levers in sports. Posture and its deformities with their corrective exercises.

Kinesiological, Muscular and mechanical analyses of fundamental movements: Mechanical analyses of major sports skills

Sports psychology- its importance in the field of physical education and sports. Motivation in sports- types, theories and dynamics.

Psychological factors affecting sports performance- Emotions, Anxiety aggression, stress ,self confidence, concentration , mental practice and goal setting.

Personality- Theories of personality, measurement of personality.

Group dynamics, Group cohesion and leadership in sports.

Cognitive process- memory and thinking. Principles of Motor skill learning. Transfer of training and its types with its implication in sports.

Long and short term psychological preparation for performance/ competition.

Psychological skill training for activation and relaxation

Spectators and sports performance.

Unit -III

Development of teacher education for physical education in India. Comparative study of professional preparation in physical education of India with those of USA, Russia, Germany, Australia and UK.

Professional and other courses of physical education in India. Role of Government agencies monitoring professional courses in physical education.

Qualities, qualifications and responsibilities of physical education personnel at primary, secondary and higher education levels. Scope of physical education personnel in the promotion of health, fitness and wellness.

Recent Government policies for promoting physical education and sports in India.

Hierarchy of organizational set-up in physical education at schools, colleges and university level.

Role of public & private sectors in the promotion of physical education and sports in the country.

Curriculum development- Concepts and principles of curriculum planning. Subject matter for different levels of education - primary, secondary and higher education.

Curriculum design and content- importance, selection and classification of subject matter with reference to age, sex and differently abled pupils. Integrated programme for boys and girls.

Teaching aids - Time-table, Concepts, credit system for various subject courses- theory and practical, Impact of technology in physical education and sports,

Curriculum evaluation: Concepts and purpose; procedure and appraisal.

Health- its objectives and spectrum. Health education, its importance and principles . Role of genetics and environment in achieving health. Health-related physical fitness.

Community health programme- Health appraisal & health instructions. International and national health promoting government & private agencies.

School Health programme and personal hygiene.

Communicable diseases: causes, symptoms, prevention through other means and Immunization.

Psychosomatic disorders/ sedentary life style diseases : causes, symptoms and prevention.

Obesity related health problems. Body weight control and its significance on health. Role of exercise, dieting and combination of exercise & dieting on weight control.

First-aid- objectives and principles. First-aid for Shock, poisoning, burns, drowning, bleeding, electric shock and common sports injuries.

Pollution- Air, water, sound and radiation. Effects of pollution on health, Preventive and safety measures from pollution.

Nutrition- Balanced diet and its components. Nutritional Deficiencies. Understanding of malnutrition and nutritional supplements.

Effects of smoking, alcohol, & drugs on health; prevention and rehabilitation.

Unit -IV

Sports training- its characteristics and principles. Training load, its features, principles and adaptation process. Means and methods of executing training load. Overload, its Causes, symptoms and remedial measures.

Strength- its characteristics, types of strength, factors determining strength and strength development.

Endurance- its characteristics, types of endurance, factors determining endurance and endurance development.

Speed- its characteristics, types of Speed, factors determining Speed and speed development.

Flexibility-its characteristics, types of flexibility, factors determining flexibility and flexibility development.

Coordinative abilities- its characteristics, types of coordinative abilities, factors determining coordinative abilities and development of coordinative abilities.

Technique and skill- its characteristics and importance. Different stages of technique development and technique training. Tactics and strategy.

Planning- its importance and principles. Types of planning.

Periodization- its importance, objectives and types of periodization. Concept of different periods - Preparatory, competition and transitional. Types of Competition:

Talent identification- process and procedure.

Research in physical education- its importance and classification. Ethical issues in research.

Methods of research- Descriptive, historical and experimental. Experimental research designs.

Identification and formulation of research problem. Types of research hypotheses and their formulation. Hypotheses testing.

Tools of research- Questionnaires, opinionnaires, interviews and observation.

Sources and steps of literature search- library, research data bases, internet- searchengines, online journals. Note taking and critical reading.

Sampling Techniques- Probability and non probability.Data, its types and collecting measures.

Normal probability curve and grading scales.

Statistical processes, their importance and uses in research.

Application of parametric and non parametric statistical techniques in research.

Computer applications- statistical packages for data analyses- SPSS, e-mail, searchengines and Microsoft office.

Preparation of research proposal, report, abstract, paper for publication and paper for presentation.

Unit -V

Test, measurement and evaluation -their types and importance in physical education and sports. Principles and processes of evaluation in physical education.

Criteria of selecting an appropriate test and administration of testing programme.

Types of tests and construction of standard knowledge and skill tests.

Tests for fitness- Physical fitness, motor fitness, motor ability and motor educability. Health related fitness tests.

Test for fitness components- strength, endurance, speed, flexibility and coordinative abilities.

Sports skill tests- Badminton, Basketball, Football, Hockey, Tennis, and Volleyball.

Anthropometric Measurements- land marks and measurement of various bodysegments ,height, sitting-height, weight, diameters, circumferences, skinfolds, body mass index, ponderal index.

Somatotype and Posture evaluating techniques.

Testing of physiological phenomenons- Blood pressure, breathing frequency vital capacity, heart rate, pulse rate, body temperature and body composition.

Tests for psychological variables- Anxiety, aggression, team cohesion, achievement motivation, mental-toughness, and self-efficacy.

Management- its principles and theories. Scope of management in physical education and sports.

Guiding principles for organizing physical education & sports programmes in institutions.

Personnel management- objectives and principles. Self-appraisal, communication skills and time management. Essential skills of administration.

Financial management- objectives, purposes, principles and scope. Planning and preparation of budget. Mechanics of purchase and auditing.

Supervision - objectives, principles and importance of supervision. Techniques of supervision.

Duties and responsibilities of a supervisor.

Facility management- planning, procuring and maintenance of facilities- indoor and outdoor facilities. Planning and management of sports infrastructure.Management of records.

Role of sports manager- interpersonal, informational and decision making. Managerial skills – technical, human and conceptual. Qualities and qualification of sports manager. Event management- its principles, planning, check list, rehearsal, itinerary, execution, reporting and follow-up procedures of an event.

Public relation- principles of public relations in physical education and sports. Mass Mediacommunication and publicity, qualifications of Public relation officer.

CMRF

Eligibility Test

Subject: MUSIC

Code No: A17

SYLLABUS

Unit-I

Technical Terms:

Sangeet, Nada: ahata & anahata , Shruti & its five jatis, Seven Vedic Swaras, Seven Swaras used in Gandharva, Suddha & Vikrit Swara, Vadi- Samvadi, Anuvadi-Vivadi, Saptak, Aroha, Avaroha, Pakad / vishesa sanchara, Purvanga, Uttaranga, Audava, Shadava, Sampurna, Varna, Alankara, Alapa, Tana, Gamaka, Alpatva-Bahutva, Graha, Ansha, Nyasa, Apanyas, Avirbhav, Tirobhava, Geeta; Gandharva, Gana, Marga Sangeeta, Deshi Sangeeta, Kutapa, Vrinda, Vaggeyakara Mela, Thata, Raga, Upanga, Bhashanga ,Meend, Khatka, Murki, Soot, Gat, Jod, Jhala, Ghaseet, Baj, Harmony and Melody, Tala, laya and different layakari, common talas in Hindustani music, Sapta Talas and 35 Talas, Taladasa pranas, Yati, Theka, Matra, Vibhag, Tali, Kaida, Quida, Peshkar, Uthaan, Gat, Paran, Rela, Tihai, Chakradar, Laggi, Ladi, Marga-Deshi Tala, Avartana, Sama, Vishama, Atita, Anagata, Dasvidha Gamakas, Panchdasa Gamakas ,Katapaydischeme, Names of 12 Chakras, Twelve Swarasthanas, Niraval, Sangati, Mudra, Shadangas , Alapana, Tanam, Kaku, Akarmatrik notations.

Folk Music

Origin, evolution and classification of Indian folk song / music.Characteristics of folk music.

Detailed study of folk music, folk instruments and performers of various regions in India.

Ragas and Talas used in folk music Folk fairs & festivals in India.

Rasa and Aesthetics:

Rasa, Principles of Rasa according to Bharata and others. Rasa nishpatti and its application to Indian Classical Music.Bhava and Rasa Rasa in relation to swara, laya, tala, chhanda and lyrics. Aesthetics according to Indian and western Philosophers. General knowledge of 64 kalas according to Vatsyayan General history of Raga-Ragini Paintings and Raga Dhayana.Interrelation of Fine Arts.

Research Methodology and Pedagogy, Avenues, Interdisciplinary aspects and Modern Technology:

Research Pedagogy: Research areas, review of literature, selection of suitable research topics and research problems, Methodology of Music research, Preparing synopsis, Data collection and its sources, Analysis of data collection, Writing project report, Research project Indexing, references and bibliography etc.

Research Avenues and its Interdisciplinary aspects: Music and Literature, Music Therapy, Philosophy, Psychology, Physics, Mathematics, Economics, Social Sciences, Religion and Culture.

Modern Technology: Electronic equipments, computer, internet etc.

New trends in Indian Music in post-independence era.

HINDUSTANI MUSIC

(VOCAL, INSTRUMENTAL AND MUSICOLOGY)

UNIT II**Applied Theory:**

Detail study of Sangeet Utpatti; Musical scales (Indian and western); Detail study of Gram, Murchchhana and Chatussarna; Jaati Lakshana, Jaati Bhed, concept of Raag, Raag-Lakshan.

Classification of Raag: 1) Gram Raag and Deshi Raag Classification 2) Male Raag classification 3) Thaata Raag classification 4) Shuddha, Chhayalag and Sankeerna Raag classification 5) Raag-Raagini classification 6) Raag-gang classification; Time theory of Raagas; Placement of shuddha and vikrit swaras on shruties in Ancient, Medieval and Modern Period; Description of popular Raagas and Taalas; Notation systems of Hindustani, Karnataka and Western Music; Merits and demerits of a vocalist (Gayak); Remix, Fusion, Orchestra, Coir and Acoustic; Comparative studies of Hindustani and Karnatak Swaras and Taalas; Karnatak names of Popular Hindustani Ragas; Knowledge of different Layakaaries such as dugun, Tigun, Chaugun, Aad, Kuad and Viaad.

History of Indian Music, contribution of Musicologists and their textual tradition:

Study of the Historical Development of Hindustani Music from Vedic to Modern period; Ancient Medieval and Modern Musicologist and Scholars:- Bharat, Naarad, Matang, Someshwardev, Jagdekmall, Nanyadev, Sharangdev, Parshwadev, Sudhakalash, Maharana Kumbha, Ramamatya, Damodar Pandit, Pt. Ahobal, Shrinivas, Hridayanarayana, Vyankatmakhi, Pt. Vishnu Digambar Palushkar, Pt. Vishnu Narayan Bhatkhande, Pt. Vinayak Rao Patwardhan, Pt. Omkarnanath Thakur, Acharya Birhaspati, Thakur Jaidev Singh, Sharachchandra Shridhar Paranjape, Bhagwat Sharan Sharma, Dr. Prem Lata Sharma, Dr. Subhadra Choudhary, Prof. R.C. Mehta, Prof. Pradeep Kumar Dixit.

Study of ancient, Medieval and Modern Treatises in Indian Music like NatyaShastra, Nardiyaa Shiksha, Sangeet makarand, Brihaddeshi, Manasollaas, Sangeet Chudamani, Bharat Bhashya, Sangeet Ratnakar, Sangeet Samaysar, Sangeetopanishatsaaroddhar, Sanageet Raj, Swaramalekalanidhi, Sangeet Darpan, Sangeet Paarijaat, Raga Tatvavibodh, Hridaya Kautuk, Hridaya Prakash, Chaturdandi Prakashika, Sangeet Chintamani, Pranavbharati etc.

Contribution of Western Scholars to Indian Music: Capt. N.A. Willard William Johnes, Capt. C.R. Day, E. Clements, FoxStrangways, H.A. Popley & Alain Danielou.

Compositional forms and their evolution:

Prabandh, Dhrupad, Dhamaar, Saadra Kheyaal, Tarana, Trivat, Chaturang, Sargam Geet, Lakshan Geet, Raagmaala etc.

Thumri, Dadra, Tappa, Hori, Kajri, and Chaiti etc. Light Music: Geet, Gazal and Bhajan etc.

Firozkhani Gat, Maseetkhani Gat, Razakhani Gat and Zafarkhani Gat and its kind.

Jaati, Javali, Kriti, Tillana, Raagam, Taanam, Pallavi.

Origin, development and presentation of above said vocal and instrumental compositions Popular artists in the field of abovesaid forms.

Musical Instruments and its Classification

Classification of Indian Musical Instruments in Ancient, Medieval and Modern period Different types of Veenas in ancient period Tat - Sitar, Sarod, Violin, Dilruba, Israj, Santoor, Tanpura, Surbahhar, Guitar. Ghan - Jaltarang, Ghatam, Morsing, Chipali, Manjeera, Jhanjh, Kartal Sushir - Flute and its varieties, Shehnai, Nagaswaram, Harmonium, Avannaddha - Pakhawaj, Tabla, Mridangam, Kanjira, Khol, Chang, Nakkara, Duff, Hudaka, Dholak. Origin, evolution, playing techniques and famous artist of these Instruments

Contribution of composers / performers to Indian Music:

Tansen, Haridas, Gopal Nayak, Sadarang, Pandit Balkrishna Bua Ichalkaranjkar, Pandit Vishnu Digambar Palushkar, Pandit Vishnu Narayan Bhatkhande, Ustaad Faiyaz Khan, Ustaad Bade Gulam Ali Khan, Ustaad Nisaar Hussain Khan, Pandit Omkar Nath Thakur, Pandit Vinayak Rao Patwardhan, Pandit Naryan Rao Vyas, Pandit C.R. Vyas, Pandit Krishna Rao Shankar Pandit, Pandit Mallikarjun Mansoor, Smt Gangubai Hangal, Kesar Bai Kerkar, Abdul Kareem Khan, Heerabai Barodekar, Suhasini Koretkar, Bade Ramdas, Siddheswari Devi, Begham Akhtar, Shobha Gurtu, Girija Devi, Savita Devi, Moghubai Kurdikar, Kishori Amonkar, Pandit Kumar Gandharv, Pandit Jasraj, Pandit Balvant Rai Bhatt. Pt. Ramashraa Jha.

Asad Ali Khan, Pt. Lal Mani Mishra, Abdul Halim Zafar Khan, Ali Akbar Khan, Sharan Rani, Amjad Ali Khan, Anath Lal, Panna Lal Ghosh, Vijay Raghav Rao, Ragunath Seth, Hari Prasad Chaurasia, Ahmad Jaan

Thirakava, Pt. Samta Prasad, Kishan Maharaj, Kudau Singh, Paagal Das, Brij Bhooshan Kabra, Vishwa Mohan Bhatt, Shiv Kumar Sharma, Bhajan Sopori, M.S. Gopal Krishnan, V.G. Jog, N. Rajam, Appa Jalgaonkar, Mehmood Dhaulpuri. Recipient of Bharat Ratna:- M.S. Subbhalakshmi, Pt. Ravi Shankar, Utsad Bismillah Khan, Lata Mangeshkar and Pt. Bhim Sen Joshi.

Purandar Das, Shyam Shastri, Mutthuswami Dixitar, Tyagraja, Swathi Tirunal Bach, Beethoven, Mozart, Yahudi Menuhin, **Gharna and Institutional System and conferences of Hindustani Music:** General study of origin and development of Gharana. Institutionalised system and their contribution to Hindustani Music. Four baanies of Dhrupad and its importance to Hindustani Music.

General study of various Gharanas of Dhrupad Kheyal and Instrumental Music.

Special features of Gharanas in vocal and Instrumental Music and its famous artists.

Purab and Punjab Angas of Tumari.

Important music conferences in India.

National and International awards in the field of music.

Contribution of Music educational institutes Akademies, Prasar Bharati, Song and Drama Division and Film in Indian Music.

UNIT III

KARNATAKA MUSIC

Applied Theory:

Musical scales (Indian & Western), Suddha and vikrita svaras, Sruti in ancient, medieval & modern period, Detailed study of grama, murchana- jaati, Jaati lakshana in ancient period, Concept of Raga, Classification of Raga from ancient to modern period, Ragalakshana-s of popular ragas, Mela - Janya system, Katapayadi and Bhuta sankhya, Janya- Raga classification, Ancient- Palai-Pan system, 22 Srutis & their distribution among Svaras and Ragas, Suladi sapta Tala- s, Scheme of 35 Talas, Tala dasa pranas, Marga and Desi talas, Talas of Tirupugazh, Shadangas and Shodasangas, important Ragas and Talas of Hindustani music. Notation systems in Hindustani, Karnatak and Western music (Staff Notation). Voice culture, Orchestration and Acoustics.

Historical perspective of music- Contributions of Scholars, Musicologists, Musical concepts in Treatises: Narada - Naradiya siksha, Sangita makaranda; Bharata - Natya sastra; Dattila-Dattilam, Matanga – Brihaddesi; Someshwara – Manasollasa; Parsvadeva - Sangita Samayasara; Sarangadeva - Sangita Ratnakara, Simhabhupala; Nanyadeva- Bharata Bhashyam; Lochana kavi - Raga Tarangini; Jagadekamalla - Sangita Chudamani; Vidyaranya - Sangita Sara, Ramamatya - Swaramelakalanidhi; Rana Kumbha - Sangita Raja; Somnatha - Raga Vibodha, Ahobala - Sangita Parijata; Govinda Dikshita - **Sangita Sudha; Venkatamakhi - Chaturdandi Prakasika; Tulaja - Sangita Saramrita ; Govinda Acharya - Sangraha Chudamani; Subbarama Dikshitar - Sangita Sampradaya Pradarsini; Abraham Panditar - Karunamrita Sagaram;**

Nadamuni Panditar - Swara Prastara Sagaram; Atoor krishna Pisharoti - Sangita Chandrika. References to Musical concepts in Silappadikaram, Sangam Texts, Panchamarabu, Tala Samudram, Mahabharata Chudamani, Yazhnool and other important texts in Tamil, Telugu, Kannada and Malayalam.

Musicologists

V.N.Bhatkhande, V.D.Paluskar, Swami Prajnanananda, B.C.Deva, P. Sambamurthy, S.Seetha, V.Raghavan, Premalata Sharma, R.Satyanarayana, T.S.Parthasarthy, N.Ramanathan, S.A.K. Durga, Balantrapu Rajanikantarao, R.C Mehta & their works. Contribution of western scholars to Indian Music; Curt Sachs, N.A.Willard, William Jones, C.R.Day, E.Clements, Fox Strangways, H.A.Popley & Alain Danielou.

Compositional forms and their evolution: Origin and development of Prabandha, Gitam, Swarajati, Jatisvarm, Tanavarnam, Padavarnam, Kirtana, Kriti, Padam, Javali, Tillana, Ragam - Tanam - Pallavi, Niraval, Kalpanasvara, Tevaram, Divyaprabandham, Tiruppugazh, Thaya, Ragamalika, Viruttam, Dandakam, Churnika, Sloka, Daru, Ashtapadi, Tarangam, Thiruvaimozhi, Thiruppavai, Chindu, Thiruvagasam, Group kritis.

Geya nataka-a, Nritya nataka-s Hindustani musical forms Dhrupad, Dhamar, Khayal, Thumri, Tappa, Tarana, Trivat, Chaturang, Vrindgan.

Music Instruments of India: Indian concept of classification of music Instruments. Origin, Evolution, Structure and playing Technique of Veena, Tambura, Violin, Chitra Vina, Viola, Mandolin, Flute, Nadasvaram, Pancha mukha vadyam, Mridangam, Taval, Kanjira, Dappu, Chenda, Maddalam, Timila, Jaltarang, Ghatam, Morsing, Chipla, Jalra, Kartala and other Talainstruments. Outline knowledge of - Sitar, Sarangi, Sarod, Shehnai, Tabla, Pakhwaj, Piano, Guitar, Clarinet.

Contribution of Composers / Performers to Music (Indian and Western): Tevaram, Alvars, Jayadeva, Dasa Kuta, Purandara Dasa, Annamacharya, Tallapaka composers, Bhadrachala Ramadasa, Arunagirinathar, Muthutandavar, Marimuttupillai, Arunachala Kavirayar, Sangeeta Mummurthy viz., Syamasastri, Tyagaraja, Muttuswami Dikshitar, Swati Tirunal, Gopalakrishna Bharati, Tanjore Quartette, Patnam Subramanya Iyer and other prominent post Trinity composers.

Ariyakudi Ramanuja Iyengar, Musiri Subrahmanya Iyer, G.N Balasubramaniam, Maharajapuram Vishwanatha Iyer, Semangudi Srinivas Iyer, Chembai Vaidyanatha Bhagavata, K.V Narayana Swamy, M.D Ramanathan, R.K Srikanthan, M. Balamurali Krishna, M.S. Subbalakshmi, D.K. Pattammal, M.L. Vasantkumari, Brinda, Mukta and other prominent vocalists.

Karaikudi Samba Siva Iyer, Veena Dhanammal, S. Balachander, Mysore Doraiswami Iyengar, S. Balachander, Chitti Babu, Mysore Chowdiah, Lalgudi Jayaraman, Dwaram Venkataswami Naidu, T.N. Krishnan, M.S. Gopalakrishnan, Sarabha Sastri, T.R. Mahalingam, N. Ramani, Sheikh Chinna Moulana, Ambalapuzha Brothers, Namagiri Pettai Krishnan, Palghat Mani Iyer, Palani Subramaniam, Viku Vinayakram, Harishankar and other prominent musicians of Veena, Violin, Flute, Nadasvaram, Mridangam, Ghatam and Kanjira.

Prominent Banis, Music training, Education and Propagation:

Merits and limitations of Gurukula sampradaya, Institutional training and Academic teaching system in Universities Nagasvaram Bani - Tanjavur style, Mridanga Bani - Tanjavur, Pudukkottai and Palakadu Styles, Banis of Dhanammal School, Ariyakudi, Musiri, GNB, Maharajapuram, Chembai and Semmangudi.

Styles of Music Trinity and analysis of their Ragas, Compositions with various musical versions.

Music propagation through Music academies, Prasar Bharati, Song and Drama Division, Films, Music festivals like Tiruvaiyaru, Chembai, Melattur etc.

Influence of other music systems on Karnatak music - Hindustani and Western.

National and International Awards in Music.

Applied Theory – Taal & Avanadhavadhya:

Description and playing techniques of Varna's and their combinations in Tabla and Pakhwaj instruments. Ten Pranas of Taal (detailed study). Detailed study of Margi and Deshi Taal system (Paddhati), knowledge of Karnataka Taal system: Detailed knowledge of Uttar Bhartiya Taal Padhati and Taalas used in Uttar Bhartiya Sangeet.

A brief knowledge of Taalas used with Rabindra Sangeet.

Laya and Layakari. Detailed knowledge of Hindustani and Karnatak taal notation system.

Brief knowledge of staff notation system.

Tabla accompaniment with vocal, (classical, semi-classical music) instrumental music and Kathak Dance.

Relationship between Taal and Chhand, Knowledge of composing Tihais of different matras.

Detailed knowledge of Tihai--Damdar, Bedam, Nauhakka and chakradar Tihais.

Mathematical calculation of chakradar- (Sadharan, Firmaishi and Kamalichakradar).

Difference between Chakradar Gat, Chakradar Tukada and Chakradar Paran. The Chakra of Thirty two tihais describe by Acharya Brihaspati.

History of Music, Treatise and Contribution of Musicologist:

Bharat, Sharangdeva, Matang, Parashwadev Nanyadev, Ramamatya, Somnath, Damodar Pandit, Ahobal, Venkatmakhi, V.N. Bhatkhande, V.D. Paluskar, Pundarik Vitthal, Dr. Subhadra Chaudhary, Nikhil Ghosh, Madhukar Ganesh Godbole, Swami Pagal Das, Purshottam Das Pakhawaji, Girish Chandra Shrivastava, BhagawatSharan Sharma, Prof.

Sudhir Kumar Saxena, Dr. Aban Mistry, Dr. Yogmaya Shukla, Arvind Mulgaonkar, Sudhir Mainkar, Dr. Arun Kumar Sen, Chhote Lal Mishra.

Detailed study of the following texts:

Natya Shastra, Sangeet Ratnakar, Bruhad Deshi, Sangeet Samyasar Sangeet Raj, Ashtottar Shat Taal, Lakshanam, Bhartiya Sangeet Vadya, Table Ka Udagam Vikas avam Vadan Shailiyan, Bhartiya Talon Ka Shastriya Vivechan, Pakhawaj avam Table ke Gharane avam, Parmparayen, Taal Kosh, Tabla Vadan Kala avam Shastra, Tabla, Bhartiya Taal Men Anekata Mein Ekta, Aesthetics of Tabla, Tabla Puran, Taal Vadya Parichaya, Tabla Granth Manjusha, Laya Taal Vichar Manthan, Tabla Vadan Mein Nihit Saundaraya, Solo Tabla Drumming of North India, Tabla of Lucknow, Taal Vadya Shashtra, Bhartiya Sangeet Men Taal, Chand Avam Roop Vidhan.

UNIT IV

Detailed study of Compositional Forms of avanaddha vadyas Definition of Bandish - expandable and nonexpandable compositions. The aesthetics of bandishen. Importance of presentation of Bandishen Detailed study of Theka, Peshkar, Quaida and its prastar (Paltas), Bant, Rela, Rau, Tukda, Mukhada, Gat and its various kinds, Rang-Rela, Fird, Paran, Tihaiies of various kinds. Gats and Quaidas of different Gharanas, Laggi- Ladi.

Study of different compositions popular in classical vocal, Semi-Classical and instrumental music:- Khayal, Masitkhani Gat, Raza Khani Gat, Thumari, Dadra, Tappa, Kajari, Chaiti, Dhrupad, Dhamar, Sadra, Jhoola, Bhajan, Gazal, Geet.

General Knowledge of compositions used in Kathak dance:- Aamad, Paran, Tatkar, Toda, Stuti Paran.

Classification of Musical Instruments, descriptions of Musical Instruments from Ancient to present period in India.

Classification of Indian Musical Instruments as per described by Bharat,Sharangdev and Dr. Lalmani Mishra. Detailed study of Origin, Evolution, Structure and playing technique of the following instruments:-

- Tat Vadya:- Veena, Vichitra Veena, Naradiya Veena, Saraswati Veena, Rudra Veena, Sitar, Sarod, Sarangi, Violin, Dilruba, Israj, Santoor, Surbahar, Tanpura, Guitar, Eaktara, Dotara.
- Sushir Vadya:- Flute, Shehanai, Nagasvaram, Claronate, Algoza, Sundari, Maguti.
- Avanaddha Vadya:- Panav, Patah, Mirdang, Pakhawaj, Tabla, Mridangam, Tavil, Khanjira, Khol, Chenda, Chang, Upang, Duff, Nakkara, Dhol, Dholak, Sambal, Dholaki, Naal, Huddaka, Pung.
- Ghana Vadya:- Jal-Tarang, Nal-Tarang, Ghatam, Morsinq, Chipli, Jalra, Kartaal, Jhanjh, Manjira.

Popular percussion instruments used in Western Music:- Kittle Drum, Snare Drum, Bass Drum, Tenor Drum and other important percussions.

Performer & Composers:-

Tabla:- Natthu Khan, Modu Khan, Bakshu Khan, Abid Hussian Khan, Haji Vilayat Ali, Salari Khan, Chudiya Imam Baksh, Ram Sahay, Munir Khan, Habibuddin Khan, Ahmemadjan Thirukuwa, Amir Hussain, Jahangir Khan, Shekh Daud, Bade Munne Khan, Karamtullah Khan, Allarakha Khan, Gyan Prakash Ghosh, Nikhil Ghosh, Gama Maharaj, Kishan Maharaj, Kanthe Maharaj, Samta Prasad (Gudai Maharaj), Anokhe Lal Mishra, Bhai Gaitonde, Pandharinath Nageshkar, Suresh Talwalkar, Hashamat Ali Khan, Zakir Hussain and contemporary tabla and pakhawaj vizards & scholars.

Pakhawaj:- Kudau Singh Jodhsingh, Nana Panse, Ayodhya Prasad, Pagal Das, Chatrapati Singh, Arjun Sejwal, Madhav Rao Alkutkar, Sakhara Ram. Nakkara Vadak:- Dilawar Khan, Aggan Khan.

Dholak Vadak:- Bafati Khan, Gulam Jafer, Dholki:- Vijay Chauhan.

Karntak Music:- Vocalists and Instrumentalists Bharat Ratan Subbalakshmi, S. Balchandar, Bal Muralikrishnan, Lalgudi Jairaman, T.N. Krishnan, Palghat Raghu, Palghat Mani Iyer, Umayalpuram Shivraman, U. Srinivasan, Vikku Vinayak Ram, Hari Shankar.

North Indian Vocalist & Instrumentalist:-

Allauddin Khan, Vilayat Khan, Ravishankar, Abdul Haleem Jafer, Balram Pathak, Nikhil Banerjee, Hafeez Ali Khan, Ali Akbar Khan, Amajad Ali Khan, V.G. Jog, D.K. Datar, N Rajam, Hari Prasad Chourasiya, Pannalal Ghosh, Bismillah Khan, Ali Hussain, Siddharam Jadhav, Krishna Rao Shankar Pandit, Mogubai Kurdikar, Kesar Bai Kerkar, Mallikarjun Mansoor, Abdul Karim Khan, Faiyaz Khan, Bhimsen Joshi, Gangubai Hangal Malini Rajurkar, Kishori Amonkar, Jas Raj, Kumar Gandharava and Aamir Khan.

Dancers:-

Acchan Maharaj, Lacchu Maharaj, Sitara Devi, Gopi Krishna, Birju Maharaj, Durga Lal, Yamini Krishnamurty Sanyukta Panigrahi and KalyaniKutti Amma.

All National and International Awardees in the field of Music, Dance, folk music and folk dances with special reference to percussion instrumentalists.

Detailed Study of Gharanas and Institutional System in Music

Definition of Baaj & Gharanas.

Historical Evaluation & Developments of Gharanas of Tabla & Pakhawaj, Delhi Gharana, Ajarada Gharana, Farrukhabad Gharana, Lucknow Gharana, Benaras Gharana, Punjab Gharana, Nana Panase Gharana, Kudau Singh Gharana.

Varna Nikas (Playing Technique) in different Gharanas.

Main Characteristics of Peshkar, Quida, Rela, Gat, Tukada, Paran, Tihai, Chakradar & Laggi Ladi on the basis of Gharanas.

Importance and utility of Tabla & Pakhawaj in classical music, semi classical, sugam & film music.

Universities, Academies and other institutions, Renowned Professors, Gurus, Academicians, Administrators who are propagating music.

UNIT V

RABINDRA SANGEET

Applied Theory:

The Knowledge of round the clock ragas and raginis, the knowledge of talas, the knowledge of kirtana, baul and other folk songs of Bengal, the Knowledge of monsoon and vernal ragas and raginis, selected provincial songs, selected verses from the Vedas and upanisads frequently chanted by Tagore. Rabindra Nath Tagore specially created talas i.e., Jhampak (5 matra), Sasthi (6 matra), Rupakra (8 matra), Nabatal (9 matra), Ekadasi (11 matra), Nabapanchatal (18 matra). Mulgan and Bhanga Gan. Brahma sangeet by Tagore's. Tagore's poetic songs, (Kabyageeti), Vedic hymns (tuned by Tagore). Patriotic songs. Akarmatrik Notation system.

Historical Perspective of Music:

Conversation between Tagore and eminent personalities of India and abroad. Western scholars on Tagore Music. 'Sangeet Chinta' full study of Tagore book. Influence of European music as a whole on Tagore. Influence of European Music and provincial tune. Tagore's creative journey in song writing and musical compositions. History of Anthology of Tagore songs. Basic knowledge in Indian classical music with special emphasis in Dhrupad, Kheyal, Tappa, Thumri. Knowledge of notation andtal (Indian and Western).

Composition forms and their evolution:

Main forms for Rabindra Sangeet. Geetanjali and song offerings – a textual study. Biography of Tagore: The Music composer upto geetanjali era throughout Tagore's life. The music composer (second part) after geetanjali to 1941. Barsamangal, sarodotsav etc.

Aesthetic approach of Rabindranath Tagore through Rabindra Sangeet. Tagore's Philosophy of Music, Sahityer pathe, Sahitya, Sahityer Swarup. Tagore's vision of music in his early days. Concept of Tagore's musical philosophy as expressed in essays, poems, novels etc. Knowledge of Raga. Bengali Songs: Pre contemporary and Post Rabindranath era. Bramhasangeet and Patriotic songs of different author other than Rabindranath. Bramhasangeet: different author other than Tagore family. Bedgan, Maghotsav, Upasana Song, Songs of Tagore House, Hansirgan.

Music Instrument of India:

Popular instruments used in Rabindra Sangeet, i.e., Esraj, Guitar, key board, Sitar, Tanpura, Harmonium, Sarod, Violin, Mandira, Organ – Piano, Flute and its varieties, Pakhawaj, Tabla, Sri khol, Dhol, Mridangam, Jaltarang etc. Rabindra Sangeet: Experiments in Rhythms and Talas Application of Various talas & rhythms. Surantar and Chhandantar.

Contribution of Scholars / Performer and their Textual Traditions:

Tagore's Geetinatya and Nrityanatya e.g. – Valmiki Prativa, Kalmrigaya, Mayar Khela, Chitrangada, Chandalika, Shyama, Taser Des, Shapmochan etc. and other Dramas full of various songs, i.e., like Prayaschitta, Visarjan, Muktheadhara, Achalayatan, Raja, Raktakarabi, Phalguni, Basant, Sisutirtha, Rinsodh, Raja o Rani, Prakirit Pratisodh. Tapati etc. (All dramatic works and example Tagores musical creativity in Gitabitan – a textual study (Part I, II, III) and Swarabitan (Notation Books) 1- 66 and others. Bhanusingher Padabali, Ritunaty. History of Anthology of Tagore's songs.

Contribution of Scholar / Performer / Musicians

Pratibha Devi, Subinoy Roy, Nilima Sen, Indira Devi Chowdhurani, Maya Sen, Suchitra Mitra, Kanika Bandyopadhyay, Santidev Ghosh, Jyotirindranath Tagore, Debendranath Tagore, Sailajaranjan Majumdar, Anadi Dastidar, Kangalicharan Sen, Amiya Thakur, Bhimrao Sastri, Ases Bandyopadhyay, Girijasankar Chakraborty, Ramesh Chandra Bandyopadhyay, Rajeswari Dutta, Sankha Ghosh, Sudhir Chakraborty etc.

Gharana and Institutionalised system of Music:

An overall survey of Tagore's musical creativity, tonal and rhythmic varieties of Tagore's musical compositions including his own experimental variations. Periods and phases of Tagore's musical compositions. Periods and phases of Tagore's musical compositions (Chronological order may be maintained). Influence of Hindustani, Karnatak and Western music on Rabindra Sangeet, Compositions who influenced Rabindra Sangeet. Tagore Song used in films. Tagore songs:

Tunes adapted from Tappa, Thumri, Tarana and Bhajan with original songs.

The cultural atmosphere of Tagore's family (Pathuriaghata and Jorasanko, Kolkata).

Thematic Variations of Tagore's music: (Puja, Prem, Swadesh, Prakriti, Vichitra, Anusthanik) Festival songs of Rabindra Sangeet. Knowledge of Hindustani songs and Tagore's opinion on these songs.

National Anthem of India and Bangladesh. Rabindra Sangeet based on classical tune.

CMRF**Subject: Costume Design & Fashion****Code: A18****UNIT –I****Apparel Designing, Manufacturing and Fashion Designing**

Body measurements- Importance and procedure. Pattern Making – Types; Drafting, Draping and Flat pattern making. Methods of transferring pattern markings. Grain– Importance and types; Pattern alteration -Importance and principles. Fitting - Standards of good fit. Pattern layout- Purpose and types. Pattern grading. Spreading- Requirement and methods, Marker planning, marker efficiency and methods of marker planning, Cutting-objectives and methods. Sewing machineries. Sewing federal standards for Seams and stitches.

Design- definition and types; Elements and Principles of design and its application to apparel. Colour theories- Prang and Munsell; Dimensions of colour; Standard colour harmonies. Fashion-Terminologies; Fashion cycle -Length of fashion cycles; Adoption of Fashion theories- Trickle down, trickle up and trickle across. Fashion forecasting- Need and techniques; Factors affecting fashion; Selection of clothing for different age groups.

UNIT –II**Textile Science and Textile Processing**

Fibre – Definition, Classification, Identification, Manufacturing process of major natural and manmade fibres, properties and their end uses. High performance fibers. Yarns – Definition and types. Spinning – Definition and classification; Chemical and Mechanical spinning; blending, opening, cleaning, doubling, carding, combing, drawing, roving, spinning. Different methods of fabric construction- Weaving- Mechanism, Parts and Functions of a simple loom; Classification of looms –Shuttle and shuttle less. Types of weaves. Knitting-Warp and Weft knitting. Non-woven - Definition and types -Web formation - Application and end uses. Developments in spinning, weaving, knitting and non-woven's.

Preparatory Processes: Desizing, Scouring and Bleaching- need and methods. Mercerizing and Degumming processes. Dyeing: Classification of dyes- Direct Vat, Sulphur, Naphthol, Reactive, Acid, Basic and Disperse dyes. Stages of dyeing. Natural dyeing-Sources, extraction, Mordants- definition, need, types, Mordanting techniques, Dyeing procedure. Printing: Direct, discharge and resist styles. After treatment of printed fabrics. Digital Printing. Finishing- Definition and classification. Basic finishes. Special finishes- Antimicrobial, UV protection, Water repellent, fragrance, flame retardant and crease resistance. Plasma, Microencapsulation and Nano finishing techniques. Recent developments in Dyeing, Printing and Finishing.

UNIT - III**Textile Testing and Technical textiles**

Selection of samples for testing. Standard R H and temperature for testing. Fiber testing- Fiber length, Fineness, Maturity, Strength, Determination of trash and lint in cotton. Yarn Testing- Yarn numbering system, Yarn count, Strength, Twist, Evenness, Hairiness. Fabric testing- Fabric Particulars –length, width, crimp, GSM, Cover factor, Fabric thickness, Fabric Strength - Tensile, tearing, Bursting strength, Fabric Abrasion, Fabric Pilling, Fabric drape, Fabric Stiffness, Fabric crease resistance and crease recovery measurements, Absorbency, Wicking, Shrinkage. Garment testing-Seam strength and seam slippage. Colour fastness - Crocking, perspiration, sunlight, laundering, pressing and dry-cleaning. Computer colour matching. Evaluation of antimicrobial activity, comfort properties. Standards for various tests.

Technical Textiles- Definition and scope, Classification and application of technical textiles - Mobile Tech, Sport Tech, Agro Tech, Pack Tech, Geo Tech, Med Tech, Build tech, Home textiles, Protective textiles, Smart and Intelligent textiles -Functions, Fibers used, Properties of fibres and areas of application. Latest trends in technical textiles. Testing of technical textiles.

UNIT- IV

Sustainable Textiles and fashion

Sustainable textiles – definition and importance, Corporate Social Responsibility in the textile and clothing sector, Environmental Management Systems. Sustainability in Dyeing, Finishing, Processing-Enzymatic processing, Ecofriendly textile fibres. Sustainable Fashion – meaning and significance; Environmental concerns related to fashion; Linear fashion and circular fashion; 4R's in sustainability – Repair, Recycle, Reuse and Reduce. Moving towards sustainable fashion - Eco fashion, Zero waste designing upcycling & recycling, Slow fashion; Environmental impact of fast fashion. Terminologies related to sustainable fashion- Sustainable clothing, Eco design, Eco label, Eco mark, Green washing, Zero waste design, Green consumer.

UNIT- V

Quality Control and Management

Definition and scope of Quality control, Apparel Quality testing - Quality standards and specification, Quality parameters and defects of fabrics and garments. Inspection - Incoming and raw material inspection: Fabric inspection – 4-point system. In process/ on-line inspection during spreading, pattern making, cutting, sewing and ironing. Final inspection: Sampling plans and AQL charts – Level of final inspection. Packing & packaging quality tests. Care labelling. Quality management- Basic concepts of Total Quality Management (TQM) – Principles of TQM – Quality Trilogy – Four pillars of TQM – PDCA cycle & PDSA cycle – Kaizan concept – 5“S Philosophy – Quality circles. Application of seven QC tools in apparel industry. Quality Standards - Definition of a standard, benefits of standards. Understanding of ISO 9001:2000 standards.

CMRF

Eligibility Test

MATHEMATICAL SCIENCES

CODE: S01

UNIT – I

Analysis: Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum.

Sequences and series, convergence, limsup, liminf. Bolzano Weierstrass theorem, Heine Borel theorem. Continuity, uniform continuity, differentiability, mean value theorem. Sequences and series of functions, uniform convergence.

Riemann sums and Riemann integral, Improper Integrals.

Monotonic functions, types of discontinuity, functions of bounded variation, Lebesgue measure, Lebesgue integral. Functions of several variables, directional derivative, partial derivative, derivative as a linear transformation, inverse and implicit function theorems.

Metric spaces, compactness, connectedness. Normed linear Spaces. Spaces of continuous functions as examples.

Linear Algebra: Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations. Algebra of matrices, rank and determinant of matrices, linear equations.

Eigenvalues and eigenvectors, Cayley-Hamilton theorem.

Matrix representation of linear transformations. Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms. Inner product spaces, orthonormal basis. Quadratic forms, reduction and classification of quadratic forms.

UNIT – II

Complex Analysis: Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric and hyperbolic functions.

Analytic functions, Cauchy-Riemann equations. Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem. Taylor series, Laurent series, calculus of residues. Conformal mappings, Mobius transformations.

Algebra: Permutations, combinations, pigeon-hole principle, inclusion-exclusion principle, derangements. Fundamental theorem of arithmetic, divisibility in \mathbb{Z} , congruences, Chinese Remainder Theorem, Euler's ϕ -function, primitive roots.

Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, class equations, Sylow theorems.

Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain. Polynomial rings and irreducibility criteria.

Fields, finite fields, field extensions, Galois Theory.

Topology: basis, dense sets, subspace and product topology, separation axioms, connectedness and compactness.

Functional Analysis: Banach Spaces, Hilbert Spaces, Spectral theorem.

UNIT – III

Ordinary Differential Equations (ODEs): Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs.

General theory of homogeneous and non-homogeneous linear ODEs, variation of parameters, Sturm-Liouville boundary value problem, Green's function.

Partial Differential Equations (PDEs): Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs.

Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

Numerical Analysis: Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods.

Calculus of Variations: Variation of a functional, Euler-Lagrange equation, Necessary and sufficient conditions for extrema. Variational methods for boundary value problems in ordinary and partial differential equations.

Linear Integral Equations: Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels. Characteristic numbers and eigen functions, resolvent kernel.

Classical Mechanics: Generalized coordinates, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle and principle of least action, Two-dimensional motion of rigid bodies, Euler's dynamical equations for the motion of a rigid body about an axis, theory of small oscillations.

UNIT – IV

Descriptive statistics

Sample space, discrete probability, independent events, Bayes theorem. Random variables and distribution functions (univariate and multivariate); expectation and moments. Independent random variables, marginal and conditional distributions. Characteristic functions. Probability inequalities (Tchebyshef, Markov, Jensen). Modes of convergence, weak and strong laws of large numbers, Central Limit theorems (i.i.d. case).

Markov chains with finite and countable state space, classification of states, limiting behaviour of n-step transition probabilities, stationary distribution, Poisson and birth-and-death processes.

Standard discrete and continuous univariate distributions. sampling distributions, standard errors and asymptotic distributions, distribution of order statistics and range.

Methods of estimation, properties of estimators, confidence intervals. Tests of hypotheses: most powerful and uniformly most powerful tests, likelihood ratio tests. Analysis of discrete data and chi-square test of goodness of fit. Large sample tests.

Simple nonparametric tests for one and two sample problems, rank correlation and test for independence. Elementary Bayesian inference.

UNIT – V

Exploratory data analysis

Gauss-Markov models, estimability of parameters, best linear unbiased estimators, confidence intervals, tests for linear hypotheses. Analysis of variance and covariance. Fixed, random and mixed effects models. Simple and multiple linear regression. Elementary regression diagnostics. Logistic regression.

Multivariate normal distribution, Wishart distribution and their properties. Distribution of quadratic forms. Inference for parameters, partial and multiple correlation coefficients and related tests. Data reduction techniques: Principle component analysis, Discriminant analysis, Cluster analysis, Canonical correlation.

Simple random sampling, stratified sampling and systematic sampling. Probability proportional to size sampling. Ratio and regression methods.

Completely randomized designs, randomized block designs and Latin-square designs.

Connectedness and orthogonality of block designs, BIBD. 2K factorial experiments: confounding and construction.

Hazard function and failure rates, censoring and life testing, series and parallel systems.

Linear programming problem, simplex methods, duality. Elementary queuing and inventory models. Steady-state solutions of Markovian queuing models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space, M/G/1.

CMRF

PHYSICAL SCIENCES

CODE: S02

UNIT I

Mathematical Methods of Physics

Dimensional analysis. Vector algebra and vector calculus-Gauss divergence theorem, Greens theorem, Stokes theorem. Linear algebra, matrices, Cayley-Hamilton Theorem. Eigenvalues and eigenvectors. Linear ordinary differential equations of first & second order, Special functions (Hermite, Bessel, Laguerre and Legendre functions). Partial differential equations (Laplace, wave and heat equations in two and three dimensions). Elements of computational techniques: root of functions, interpolation, extrapolation, integration by trapezoid and Simpson's rule, Solution of first order differential equation using Runge- Kutta method. Fourier series, Fourier and Laplace transforms. Elements of complex analysis, analytic functions; Taylor & Laurent series; poles, residues and evaluation of integrals. Elementary probability theory, random variables, binomial, Poisson and normal distributions. Equation of continuity - Application to hydrodynamics, equation of heat flow. Finite difference methods. Tensors. Introductory group theory: SU(2), O(3).

Classical Mechanics

Newton's laws. Dynamical systems, Phase space dynamics, stability analysis. Central force motions. Two body Collisions - scattering in laboratory and Centre of mass frames. Rigid body dynamics- Symmetrical top and Fast and sleeping top - moment of inertia tensor. Non-inertial frames and pseudoforces. Variational principle. Generalized coordinates. D'Alembert's principle and Lagrangian equations of motion - Hamiltonian formalism and equations of motion - Conservation laws and cyclic coordinates - Liouville's theorem. Periodic motion: small oscillations, normal modes. Special theory of relativity- Lorentz transformations, relativistic kinematics and mass-energy equivalence - Invariance of Maxwell's equations - Relativistic Lagrangian and Hamiltonian for a free particle. Canonical transformations- Poisson brackets- Hamilton-Jacobi theory - action-angle variables. Canonical transformations- Poisson brackets- Hamilton-Jacobi theory - action-angle variables.

UNIT II

Electromagnetic Theory

Electrostatics: Gauss's law and its applications, Laplace and Poisson equations, boundary value problems. Magnetostatics: Biot-Savart law, Ampere's theorem. Electromagnetic induction. Maxwell's equations in free space and linear isotropic media; boundary conditions on the fields at interfaces- Poynting's theorem - Lorentz invariance of Maxwell's equation.. Scalar and vector potentials, gauge invariance. Electromagnetic waves in free space- Dynamics of charged particles in static and uniform electromagnetic fields.

Dielectrics and conductors. Radiation- from moving charges and dipoles and retarded potentials. Reflection and refraction, polarization, Fresnel's law, interference, coherence, and diffraction. Dynamics of charged particles in static and uniform electromagnetic fields. Dispersion relations in plasma. Transmission lines and wave guides

Quantum Mechanics

Wave-particle duality. Schrödinger equation (time-dependent and time-independent). Eigenvalue problems (particle in a box, harmonic oscillator, etc.). Tunneling through a barrier. Wave-function in coordinate and momentum representations. Commutators and Heisenberg uncertainty principle. Dirac notation for state vectors. Motion in a central potential: orbital angular momentum, angular momentum algebra, spin, addition of angular momenta; Hydrogen atom. Stern-Gerlach experiment. Time- independent perturbation theory and applications. Variational method. Time dependent perturbation theory and Fermi's golden rule, selection rules. Identical particles, Pauli exclusion principle, spin-statistics connection.

Spin-orbit coupling, fine structure. WKB approximation. Elementary theory of scattering: partial waves, Born approximation. Relativistic quantum mechanics: Klein-Gordon and Dirac equations. Semi-classical theory of radiation.

UNIT III**Electronics and Experimental Methods**

Semiconductor devices (diodes, junctions, transistors, field effect devices, homo- and hetero-junction devices), device structure, device characteristics, frequency dependence and applications. Opto-electronic devices (solar cells, photo-detectors, LEDs). Operational amplifiers and their applications. Digital techniques and applications (registers, counters, comparators and similar circuits). A/D and D/A converters. Microprocessor and microcontroller basics. Linear and nonlinear curve fitting, chi-square test. Transducers (temperature, pressure/vacuum, magnetic fields, vibration, optical, and particle detectors). Measurement and control. Signal conditioning and recovery. Impedance matching, amplification (Op-amp based, instrumentation amp, feedback), filtering and noise reduction, shielding and grounding. Fourier transforms, lock-in detector, box-car integrator, modulation techniques. High frequency devices (including generators and detectors). Data interpretation and analysis. Precision and accuracy. Error analysis, propagation of errors. Least squares fitting,

UNIT IV**Thermodynamic and Statistical Physics**

Laws of thermodynamics and their consequences. Thermodynamic potentials, Maxwell relations, chemical potential, phase equilibria. Phase space, micro- and macro-states. Micro-canonical, canonical and grand-canonical ensembles and partition functions. Free energy and its connection with thermodynamic quantities. Classical and quantum statistics. Ideal Bose and Fermi gases. Principle of detailed balance. Blackbody radiation and Planck's distribution law. First- and second-order phase transitions. Diamagnetism, paramagnetism, and ferromagnetism. Ising model. Bose-Einstein condensation. Diffusion equation. Random walk and Brownian motion. Introduction to nonequilibrium processes.

Condensed Matter Physics

Bravais lattices. Reciprocal lattice. Diffraction and the structure factor. Bonding of solids. Elastic properties, phonons, lattice specific heat. Free electron theory and electronic specific heat. Response and relaxation phenomena. Drude model of electrical and thermal conductivity. Hall effect and thermoelectric power. Electron motion in a periodic potential, band theory of solids: metals, insulators and semiconductors. Superconductivity: type-I and type-II superconductors. Josephson junctions. Superfluidity. Defects and dislocations. Ordered phases of matter: translational and orientational order, kinds of liquid crystalline order. Quasi crystals.

UNIT V**Atomic & Molecular Physics**

Quantum states of an electron in an atom. Electron spin. Spectrum of helium and alkali atom. Relativistic corrections for energy levels of hydrogen atom, hyperfine structure and isotopic shift, width of spectrum lines, LS & JJ couplings. Zeeman, Paschen-Bach & Stark effects. Electron spin resonance. Nuclear magnetic resonance, chemical shift. Frank-Condon principle. Born-Oppenheimer approximation. Electronic, rotational, vibrational and Raman spectra of diatomic molecules, selection rules. Lasers: spontaneous and stimulated emission, Einstein A & B coefficients. Optical pumping, population inversion, rate equation. Modes of resonators and coherence length.

Nuclear and Particle Physics

Basic nuclear properties: size, shape and charge distribution, spin and parity. Binding energy, semi-empirical mass formula, liquid drop model. Nature of the nuclear force, form of nucleon-nucleon potential, charge-independence and charge-symmetry of nuclear forces. Deuteron problem. Evidence of shell structure, single-particle shell model, its validity and limitations. Rotational spectra. Elementary ideas of alpha, beta and gamma decays and their selection rules. Fission and fusion. Nuclear reactions, reaction mechanism, compound nuclei and direct reactions.

Classification of fundamental forces. Elementary particles and their quantum numbers (charge, spin, parity, isospin, strangeness, etc.). Gellmann-Nishijima formula. Quark model, baryons and mesons. C, P, and T invariance. Application of symmetry arguments to particle reactions. Parity non-conservation in weak interaction. Relativistic kinematics.

CMRF

Eligibility Test

CHEMICALSCIENCES

CODE: S03

UNIT I

Inorganic Chemistry

- Chemical periodicity
- Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory).
- Concepts of acids and bases, Hard-Soft acid base concept, Buffer Solutions Non-aqueous solvents.
- Main group elements and their compounds: Allotropy, synthesis, structure and bonding, industrial importance of the compounds.
- Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.
- Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications.
- Organometallic compounds: synthesis, bonding and structure, and reactivity.
- Organometallics in homogeneous catalysis Cages and metal clusters.
- Analytical chemistry- separation, spectroscopic, electro- and thermoanalytical methods.
- Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine.
- Characterization of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-vis, NQR, MS, electron spectroscopy and microscopic techniques.
- Nuclear chemistry: nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.

UNIT II

Physical Chemistry:

- Basic principles of quantum mechanics: Postulates; operator algebra; exactly solvable systems: particle-in-a-box, harmonic oscillator and the hydrogen atom, including shapes of atomic orbitals; orbital and spin angular momenta; tunneling.
- Approximate methods of quantum mechanics: Variational principle; perturbation theory up to second order in energy; applications.
- Atomic structure and spectroscopy; term symbols; many-electron systems and antisymmetry principle.
- Chemical bonding in diatomics; elementary concepts of MO and VB theories; Huckel theory for conjugated π -electron systems.
- Chemical applications of group theory; symmetry elements; point groups; character tables; selection rules.
- Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.

- Chemical thermodynamics: Laws, state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.
- Statistical thermodynamics: Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities-calculations for model systems.

UNIT III

Physical Chemistry Continuation

- Electrochemistry: Nernst equation, redox systems, electrochemical cells; Debye- Huckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.
- Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.
- Colloids and surfaces: Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis.
- Solid state: Crystal structures; Bragg's law and applications; band structure of solids.
- Polymer chemistry: Molar masses; kinetics of polymerization.
- Data analysis: Mean and standard deviation; absolute and relative errors; linear regression; covariance and correlation coefficient.

UNIT IV

Organic Chemistry

- IUPAC nomenclature of organic molecules including regio- and stereoisomers.
- Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.
- Aromaticity: Benzenoid and non-benzenoid compounds – generation and reactions.
- Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes.
- Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.
- Common named reactions and rearrangements – applications in organic synthesis.
- Organic transformations and reagents: Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic). Chemo, regio and stereoselective transformations.
- Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.
- Asymmetric synthesis: Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.

- Pericyclic reactions – electrocycloaddition, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.
- Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).
- Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.
- Structure determination of organic compounds by IR, UV-Vis, ^1H & ^{13}C NMR and Mass spectroscopic techniques.
- Chemistry uses in medicine or medical technology

Chemical applications to human health.

- Applications of surface tension Composition of food dye.

UNIT V**Interdisciplinary topics**

- Chemistry in nanoscience and technology.
- Catalysis and green chemistry.
- Medicinal chemistry.
- Supramolecular chemistry.
- Environmental chemistry.

CMRF

Eligibility Test

LIFE SCIENCES

CODE: S04

UNIT I

MOLECULES AND THEIR INTERACTION RELAVENT TO BIOLOGY

- Structure of atoms, molecules and chemical bonds.
- B Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).
- C. Stablizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction, etc.).
- D Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties).
- Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
- Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes
- Conformation of proteins (Ramachandran plot, secondary structure, domains, motif and folds).
- Conformation of nucleic acids (helix (A, B, Z), t-RNA, micro-RNA).
- Stability of proteins and nucleic acids.
- Metabolism of carbohydrates, lipids, amino acids nucleotides and vitamins.

CELLULAR ORGANIZATION**Membrane structure and function**

(Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, membrane pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes).

Structural organization and function of intracellular organelles (Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility).

Organization of genes and chromosomes (Operon, unique and repetitive DNA, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons).

Cell division and cell cycle (Mitosis and meiosis, their regulation, steps in cell cycle, regulation and control of cell cycle).

Microbial Physiology (Growth yield and characteristics, strategies of cell division, stress response)

FUNDAMENTAL PROCESSES

DNA replication, repair and recombination (Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination).

RNA synthesis and processing (transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and polyadenylation, structure and function of different types of RNA, RNA transport).

Protein synthesis and processing (Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Post- translational modification of proteins).

Control of gene expression at transcription and translation level (regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing).

UNIT II

Cell communication and cell signaling

Host parasite interaction Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.

Cell signaling Hormones and their receptors, cell surface receptor, signaling through Gprotein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two- component systems, light signaling in plants, bacterial chemotaxis and quorum sensing.

Cellular communication Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.

Cancer : Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

Innate and adaptive immune system Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity. B and T cell epitopes, structure and function of antibody molecules. generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell- mediated immune responses, primary and secondary immune modulation, the complement system, Toll-like receptors, cell-mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congenital and acquired immunodeficiencies, vaccines.

DEVELOPMENTAL BIOLOGY

Basic concepts of development : Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development

Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.

Morphogenesis and organogenesis in animals : Cell aggregation and differentiation in Dictyostelium; axes and pattern formation in Drosophila, amphibia and chick; organogenesis – vulva formation in Caenorhabditis elegans, eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development- larval formation, metamorphosis; environmental regulation of normal development; sex determination.

Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in Arabidopsis and Antirrhinum Programmed cell death, aging and senescence

UNIT III**SYSTEM PHYSIOLOGY - PLANT**

Photosynthesis - Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO₂ fixation-C₃, C₄ and CAM pathways.

Respiration and photorespiration – Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.

Nitrogen metabolism - Nitrate and ammonium assimilation; amino acid biosynthesis.

Plant hormones – Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action.

Sensory photobiology - Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks.

Solute transport and photoassimilate translocation – uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates.

Secondary metabolites - Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.

Stress physiology – Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses.

SYSTEM PHYSIOLOGY - ANIMAL

Blood and circulation - Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis.

Cardiovascular System: Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation of all above.

Respiratory system - Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

Nervous system - Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.

Sense organs - Vision, hearing and tactile response.

Excretory system - Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance.

Thermoregulation - Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.

Stress and adaptation

Digestive system - Digestion, absorption, energy balance, BMR.

Endocrinology and reproduction - Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, gametogenesis, ovulation, neuroendocrine regulation

UNIT IV**INHERITANCE BIOLOGY**

Mendelian principles : Dominance, segregation, independent assortment.

Concept of gene : Allele, multiple alleles, pseudoallele, complementation tests

Extensions of Mendelian principles : Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.

Gene mapping methods : Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.

Extra chromosomal inheritance : Inheritance of Mitochondrial and chloroplast genes, maternal inheritance.

Microbial genetics : Methods of genetic transfers – transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

Human genetics : Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders.

Quantitative genetics : Polygenic inheritance, heritability and its measurements, QTL mapping.

Mutation : Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

Structural and numerical alterations of chromosomes : Deletion, duplication, inversion, translocation, ploidy and their genetic implications.

Recombination : Homologous and non-homologous recombination including transposition.

DIVERSITY OF LIFE FORMS:

Principles & methods of taxonomy:

- Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitative methods of taxonomy of plants, animals and microorganisms.

Levels of structural organization:

- Unicellular, colonial and multicellular forms. Levels of organization of tissues, organs & systems. Comparative anatomy, adaptive radiation, adaptive modifications.

Outline classification of plants, animals & microorganisms:

- Important criteria used for classification in each taxon. Classification of plants, animals and microorganisms. Evolutionary relationships among taxa.

Natural history of Indian subcontinent:

- Major habitat types of the subcontinent, geographic origins and migrations of species.

Common Indian mammals, birds. Seasonality and phenology of the subcontinent.

Organisms of health & agricultural importance: Common parasites and pathogens of humans, domestic animals and crops.

Organisms of conservation concern: Rare, endangered species. Conservation strategies.

ECOLOGICAL PRINCIPLES

The Environment: Physical environment; biotic environment; biotic and abiotic interactions.

Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

Population Ecology: Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection); concept of metapopulation – demes and dispersal, interdemec extinctions, age structured populations.

Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis.

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.

Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax.

Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C,N,P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine).

Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

Applied Ecology: Environmental pollution; global environmental change; biodiversity: status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches.

Conservation Biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

UNIT V

EVOLUTION AND BEHAVIOUR

Emergence of evolutionary thoughts Lamarck; Darwin—concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; Spontaneity of mutations; The evolutionary synthesis.

Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concept of Oparin and Haldane; Experiment of Miller (1953); The first cell; Evolution of prokaryotes; Origin of eukaryotic cells; Evolution of unicellular eukaryotes; Anaerobic metabolism, photosynthesis and aerobic metabolism.

Paleontology and Evolutionary History: The evolutionary time scale; Eras, periods and epoch; Major events in the evolutionary time scale; Origins of unicellular and multi cellular organisms; Major groups of plants and animals; Stages in primate evolution including Homo.

Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; Molecular tools in phylogeny, classification and identification; Protein and nucleotide sequence analysis; origin of new genes and proteins; Gene duplication and divergence.

The Mechanisms: Population genetics – Populations, Gene pool, Gene frequency; Hardy- Weinberg Law; concepts and rate of change in gene frequency through natural selection, migration and random genetic drift; Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; Convergent evolution; Sexual selection; Co-evolution.

Brain, Behavior and Evolution: Approaches and methods in study of behavior; Proximate and ultimate causation; Altruism and evolution-Group selection, Kin selection, Reciprocal altruism; Neural basis of learning, memory, cognition, sleep and arousal; Biological clocks; Development of behavior; Social communication; Social dominance; Use of space and territoriality; Mating systems, Parental investment and Reproductive success; Parental care; Aggressive behavior; Habitat selection and optimality in foraging; Migration, orientation and navigation; Domestication and behavioral changes.

APPLIED BIOLOGY:

Microbial fermentation and production of small and macro molecules. Application of immunological principles, vaccines, diagnostics. Tissue and cell culture methods for plants and animals. Transgenic animals and plants, molecular approaches to diagnosis and strain identification. Genomics and its application to health and agriculture, including gene therapy. Bioresource and uses of biodiversity. Breeding in plants and animals, including marker – assisted selection Bioremediation and phytoremediation Biosensors

METHODS IN BIOLOGY**Molecular Biology and Recombinant DNA methods:**

Isolation and purification of RNA , DNA (genomic and plasmid) and proteins, different separation methods.

Analysis of RNA, DNA and proteins by one and two dimensional gelelectro phoresis, Isoelectric focusing gels.

Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems.Expression of recombinant proteins using bacterial, animal and plant vectors.

Isolation of specific nucleic acid sequences Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YACvectors.

In vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms.

Protein sequencing methods, detection of post translation modification of proteins. DNA sequencing methods, strategies for genome sequencing.

Methods for analysis of gene expression at RNA and protein level, large scale expression, such as micro array based techniques Isolation, separation and analysis of carbohydrate and lipid moleculesRFLP, RAPD and AFLP.

Techniques Histochemical and Immunotechniques:

Antibody generation, Detection of molecules using ELISA, RIA, western blot, immunoprecipitation, fluocytometry and immunofluorescence microscopy, detection of molecules in living cells, in situ localization by techniques such as FISH and GISH.

Biophysical Method:

Molecular analysis using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy Molecular structure determination using X-ray diffraction and NMR, Molecular analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.

Statistical Methods:

Measures of central tendency and dispersal; probability distributions (Binomial,Poisson and normal); Sampling distribution; Difference between parametric and non-parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation; t-test; Analysis of variance; X2 test;; Basic introduction to Muetrovariate statistics, etc.

Radiolabeling techniques:

Detection and measurement of different types of radioisotopes normally used in biology, incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.

Microscopic techniques:

Visulization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM, image processing methods in microscopy.

Electrophysiological methods:

Single neuron recording, patch-clamp recording, ECG, Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, fMRI, CAT .

Methods in field biology:

Methods of estimating population density of animals and plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization: ground and remote sensing methods.

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COMPUTER SCIENCE AND APPLICATIONS

CODE:S05

Unit - I Discrete Structures and Optimization

Mathematical Logic: Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference.

Sets and Relations: Set Operations, Representation and Properties of Relations, Equivalence Relations, Partially Ordering.

Counting, Mathematical Induction and Discrete Probability: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Inclusion- Exclusion Principle, Mathematical Induction, Probability, Bayes' Theorem.

Group Theory: Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory.

Graph Theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees and Cut-Sets.

Boolean Algebra: Boolean Functions and its Representation, Simplifications of Boolean Functions.

Optimization: Linear Programming - Mathematical Model, Graphical Solution, Simplex and Dual Simplex Method, Sensitive Analysis; Integer Programming, Transportation and Assignment Models, PERT-CPM: Diagram Representation, Critical Path Calculations, Resource Levelling, Cost Consideration in Project Scheduling.

Computer System Architecture

Digital Logic Circuits and Components: Digital Computers, Logic Gates, Boolean Algebra, Map Simplifications, Combinational Circuits, Flip-Flops, Sequential Circuits, Integrated Circuits, Decoders, Multiplexers, Registers and Counters, Memory Unit.

Data Representation: Data Types, Number Systems and Conversion, Complements, Fixed Point Representation, Floating Point Representation, Error Detection Codes, Computer Arithmetic - Addition, Subtraction, Multiplication and Division Algorithms.

Register Transfer and Microoperations: Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Microoperations.

Basic Computer Organization and Design: Stored Program Organization and Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output, Interrupt.

Programming the Basic Computer: Machine Language, Assembly Language, Assembler, Program Loops, Subroutines, Input-Output Programming.

Microprogrammed Control: Control Memory, Address Sequencing, Design of Control Unit.

Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC Computer, CISC Computer.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing Array Processors.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, Serial Communication.

Memory Hierarchy: Main Memory, Auxillary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Interprocessor Communication and Synchronization, Cache Coherence, Multicore Processors.

Unit - II Programming Languages and Computer Graphics

Language Design and Translation Issues: Programming Language Concepts, Paradigms and Models, Programming Environments, Virtual Computers and Binding Times, Programming Language Syntax, Stages in Translation, Formal Transition Models.

Elementary Data Types: Properties of Types and Objects; Scalar and Composite Data Types.

Programming in C: Tokens, Identifiers, Data Types, Sequence Control, Subprogram Control, Arrays, Structures, Union, String, Pointers, Functions, File Handling, Command Line Arguments, Preprocessors.

Object Oriented Programming: Class, Object, Instantiation, Inheritance, Encapsulation, Abstract Class, Polymorphism.

Programming in C++: Tokens, Identifiers, Variables and Constants; Data types, Operators, Control statements, Functions Parameter Passing, Virtual Functions, Class and Objects; Constructors and Destructors; Overloading, Inheritance, Templates, Exception and Event Handling; Streams and Files; Multifile Programs.

Web Programming: HTML, DHTML, XML, Scripting, Java, Servlets, Applets.

Computer Graphics: Video-Display Devices, Raster-Scan and Random-Scan Systems; Graphics Monitors, Input Devices, Points and Lines; Line Drawing Algorithms, Mid-Point Circle and Ellipse Algorithms; Scan Line Polygon Fill Algorithm, Boundary-Fill and Flood-Fill.

2-D Geometrical Transforms and Viewing: Translation, Scaling, Rotation, Reflection and Shear Transformations; Matrix Representations and Homogeneous Coordinates; Composite Transforms, Transformations Between Coordinate Systems, Viewing Pipeline, Viewing Coordinate Reference Frame, Window to View-Port Coordinate Transformation, Viewing Functions, Line and Polygon Clipping Algorithms.

3-D Object Representation, Geometric Transformations and Viewing: Polygon Surfaces, Quadric Surfaces, Spline Representation, Bezier and B-Spline Curves; Bezier and B-Spline Surfaces; Illumination Models, Polygon Rendering Methods, Viewing Pipeline and Coordinates; General Projection Transforms and Clipping.

Database Management Systems

Database System Concepts and Architecture: Data Models, Schemas, and Instances; Three- Schema Architecture and Data Independence; Database Languages and Interfaces; Centralized and Client/Server Architectures for DBMS.

Data Modeling: Entity-Relationship Diagram, Relational Model - Constraints, Languages, Design, and Programming, Relational Database Schemas, Update Operations and Dealing with Constraint Violations; Relational Algebra and Relational Calculus; Codd Rules.

SQL: Data Definition and Data Types; Constraints, Queries, Insert, Delete, and Update Statements; Views, Stored Procedures and Functions; Database Triggers, SQL Injection.

Normalization for Relational Databases: Functional Dependencies and Normalization; Algorithms for Query Processing and Optimization; Transaction Processing, Concurrency Control Techniques, Database Recovery Techniques, Object and Object-Relational Databases; Database Security and Authorization.

Enhanced Data Models: Temporal Database Concepts, Multimedia Databases, Deductive Databases, XML and Internet Databases; Mobile Databases, Geographic Information Systems, Genome Data Management, Distributed Databases and Client-Server Architectures.

Data Warehousing and Data Mining: Data Modeling for Data Warehouses, Concept Hierarchy, OLAP and OLTP; Association Rules, Classification, Clustering, Regression,

Support Vector Machine, K-Nearest Neighbour, Hidden Markov Model, Summarization, Dependency Modeling, Link Analysis, Sequencing Analysis, Social Network Analysis.

Big Data Systems: Big Data Characteristics, Types of Big Data, Big Data Architecture, Introduction to Map-Reduce and Hadoop; Distributed File System, HDFS.

NOSQL: NOSQL and Query Optimization; Different NOSQL Products, Querying and Managing NOSQL; Indexing and Ordering Data Sets; NOSQL in Cloud.

System Software and Operating System

System Software: Machine, Assembly and High-Level Languages; Compilers and Interpreters; Loading, Linking and Relocation; Macros, Debuggers.

Basics of Operating Systems: Operating System Structure, Operations and Services; System Calls, Operating-System Design and Implementation; System Boot.

Process Management: Process Scheduling and Operations; Interprocess Communication, Communication in Client-Server Systems, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization.

Threads: Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

CPU Scheduling: Scheduling Criteria and Algorithms; Thread Scheduling, Multiple- Processor Scheduling, Real-Time CPU Scheduling.

Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and Detection; Recovery from Deadlock.

Memory Management: Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-MappedFiles. Storage Management: Mass-Storage Structure, Disk Structure, Scheduling and Management, RAID Structure.

File and Input/Output Systems: Access Methods, Directory and Disk Structure; File- System Mounting, File Sharing, File-System Structure and Implementation; Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance; Recovery, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations.

Security: Protection, Access Matrix, Access Control, Revocation of Access Rights, Program Threats, System and Network Threats; Cryptography as a Security Tool, User Authentication, Implementing Security Defenses.

Virtual Machines: Types of Virtual Machines and Implementations; Virtualization.

Linux Operating Systems: Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output; Interprocess Communication, Network Structure.

Windows Operating Systems: Design Principles, System Components, Terminal Services and Fast User Switching; File System, Networking.

Distributed Systems: Types of Network based Operating Systems, Network Structure, Communication Structure and Protocols; Robustness, Design Issues, Distributed File Systems.

Unit – III: Software Engineering

Software Process Models: Software Process, Generic Process Model – Framework Activity, Task Set and Process Patterns; Process Lifecycle, Prescriptive Process Models, Project Management, Component Based Development, Aspect-Oriented Software Development, Formal Methods, Agile Process Models – Extreme Programming (XP), Adaptive Software Development, Scrum, Dynamic System Development Model, Feature Driven Development, Crystal, Web Engineering.

Software Requirements: Functional and Non-Functional Requirements; Eliciting Requirements, Developing Use Cases, Requirement Analysis and Modelling; Requirements Review, Software Requirement and Specification (SRS) Document.

Software Design: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Cohesion and Coupling; Object-Oriented Design, Data Design, Architectural Design, User Interface Design, Component Level Design.

Software Quality: McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance, Risk Management, Risk Mitigation, Monitoring and Management (RMMM); Software Reliability.

Estimation and Scheduling of Software Projects: Software Sizing, LOC and FP based Estimations; Estimating Cost and Effort; Estimation Models, Constructive Cost Model (COCOMO), Project Scheduling and Staffing; Time-line Charts.

Software Testing: Verification and Validation; Error, Fault, Bug and Failure; Unit and Integration Testing; White-box and Black-box Testing; Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing; Regression Testing, Performance Testing, Stress Testing.

Software Configuration Management: Change Control and Version Control; Software Reuse, Software Re-engineering, Reverse Engineering.

Data Structures and Algorithms

Data Structures: Arrays and their Applications; Sparse Matrix, Stacks, Queues, Priority Queues, Linked Lists, Trees, Forest, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B* Tree, Data Structure for Sets, Graphs, Sorting and Searching Algorithms; Hashing.

Performance Analysis of Algorithms and Recurrences: Time and Space Complexities; Asymptotic Notation, Recurrence Relations.

Design Techniques: Divide and Conquer; Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound.

Lower Bound Theory: Comparison Trees, Lower Bounds through Reductions.

Graph Algorithms: Breadth-First Search, Depth-First Search, Shortest Paths, Maximum Flow, Minimum Spanning Trees.

Complexity Theory: P and NP Class Problems; NP-completeness and Reducibility.

Selected Topics: Number Theoretic Algorithms, Polynomial Arithmetic, Fast Fourier Transform, String Matching Algorithms.

Advanced Algorithms: Parallel Algorithms for Sorting, Searching and Merging, Approximation Algorithms, Randomized Algorithms.

Unit – IV : Theory of Computation and Compilers

Theory of Computation: Formal Language, Non-Computational Problems, Diagonal Argument, Russels's Paradox.

Regular Language Models: Deterministic Finite Automaton (DFA), Non-Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, Non- Regular Languages, Lexical Analysis.

Context Free Language: Pushdown Automaton (PDA), Non-Deterministic Pushdown Automaton (NPDA), Context Free Grammar, Chomsky Normal Form, Greibach Normal Form, Ambiguity, Parse Tree Representation of Derivation Trees, Equivalence of PDA's and Context Free Grammars; Properties of Context Free Language.

Turing Machines (TM): Standard Turing Machine and its Variations; Universal Turing Machines, Models of Computation and Church-Turing Thesis; Recursive and Recursively- Enumerable Languages; Context-Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages, Construction of TM for Simple Problems.

Unsolvable Problems and Computational Complexity: Unsolvable Problem, Halting Problem, Post Correspondence Problem, Unsolvable Problems for Context-Free Languages, Measuring and Classifying Complexity, Tractable and Intractable Problems.

Syntax Analysis: Associativity, Precedence, Grammar Transformations, Top Down Parsing, Recursive Descent Predictive Parsing, LL(1) Parsing, Bottom up Parsing, LR Parser, LALR(1) Parser.

Semantic Analysis: Attribute Grammar, Syntax Directed Definitions, Inherited and Synthesized Attributes; Dependency Graph, Evaluation Order, S-attributed and L-attributed Definitions; Type-Checking.

Run Time System: Storage Organization, Activation Tree, Activation Record, Stack Allocation of Activation Records, Parameter Passing Mechanisms, Symbol Table.

Intermediate Code Generation: Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls.

Code Generation and Code Optimization: Control-flow, Data-flow Analysis, Local Optimization, Global Optimization, Loop Optimization, Peep-Hole Optimization, Instruction Scheduling.

Data Communication and Computer Networks

Data Communication: Components of a Data Communication System, Simplex, Half- Duplex and Duplex Modes of Communication; Analog and Digital Signals; Noiseless and Noisy Channels; Bandwidth, Throughput and Latency; Digital and Analog Transmission; Data Encoding and Modulation Techniques; Broadband and Baseband Transmission; Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms.

Computer Networks: Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet.

Network Models: Layered Architecture, OSI Reference Model and its Protocols; TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses; Switching Techniques.

Functions of OSI and TCP/IP Layers: Framing, Error Detection and Correction; Flow and Error Control; Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs.

IPv4 Structure and Address Space; Classful and Classless Addressing; Datagram, Fragmentation and Checksum; IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery; Routing Algorithms, TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP.

World Wide Web (WWW): Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP.

Network Security: Malwares, Cryptography and Steganography; Secret-Key Algorithms, Public-Key Algorithms, Digital Signature, Virtual Private Networks, Firewalls.

Mobile Technology: GSM and CDMA; Services and Architecture of GSM and Mobile Computing; Middleware and Gateway for Mobile Computing; Mobile IP and Mobile Communication Protocol; Communication Satellites, Wireless Networks and Topologies; Cellular Topology, Mobile Adhoc Networks, Wireless Transmission and Wireless LANs; Wireless Geolocation Systems, GPRS and SMS.

Cloud Computing and IoT: SaaS, PaaS, IaaS, Public and Private Cloud; Virtualization, Virtual Server, Cloud Storage, Database Storage, Resource Management, Service Level Agreement, Basics of IoT.

Unit – V : Artificial Intelligence (AI)

Approaches to AI: Turing Test and Rational Agent Approaches; State Space Representation of Problems, Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures.

Knowledge Representation: Logic, Semantic Networks, Frames, Rules, Scripts, Conceptual Dependency and Ontologies; Expert Systems, Handling Uncertainty in Knowledge.

Planning: Components of a Planning System, Linear and Non Linear Planning; Goal Stack Planning, Hierarchical Planning, STRIPS, Partial Order Planning.

Natural Language Processing: Grammar and Language; Parsing Techniques, Semantic Analysis and Pragmatics.

Multi Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools.

Fuzzy Sets: Notion of Fuzziness, Membership Functions, Fuzzification and Defuzzification; Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables; Fuzzy Relations, Fuzzy Rules and Fuzzy Inference; Fuzzy Control System and Fuzzy Rule Based Systems.

Genetic Algorithms (GA): Encoding Strategies, Genetic Operators, Fitness Functions and GA Cycle; Problem Solving using GA.

Artificial Neural Networks (ANN): Supervised, Unsupervised and Reinforcement Learning; Single Perceptron, Multi Layer Perceptron, Self Organizing Maps, Hopfield Network.

Security and Cryptography

Network Security: Security Attacks, Security Services, Security Algorithm, Stream cipher and Block cipher, Traditional Block Cipher Structure, Symmetric and Asymmetric-key, Malwares, Cryptography and Steganography.

Cryptosystem: Secret-Key Algorithms, DES, Triple DES, AES, IDEA, Blowfish, RC5. Public-key Cryptosystem: RSA Algorithm, Key Management, Diffie- Hellman Key exchange, Elliptic Curve Cryptography Message Authentication and Hash functions, Hash and Mac Algorithm Digital Signatures: Elgamal Digital Signature Scheme, Schnorr Digital Signature Scheme NIST Digital Signature Algorithm, Elliptic Curve Digital Signature Algorithm, RSA-

Digital Signature Algorithm – Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption – Symmetric Key Distribution Using Asymmetric Key Encryption

Web Security: Secure Socket Layer, Secure Electronic Transaction. System Security, Intruders and Viruses, Firewalls, Password Security.

Cloud Computing and Internet of Things

Cloud Computing: Roots of Cloud Computing, Layers and Types of Cloud, Features of a cloud, Infrastructure Management, Cloud Services, Challenges and Risks. Migrating into a Cloud: Broad Approaches, Seven Step Model. Integration as a Service-Integration Methodology, SaaS, PaaS, IaaS, Public and Private Cloud; Virtualization, Virtual Server, Cloud Storage, Database Storage, Resource Management, Service Level Agreement

Fundamentals of IOT: Enabling Technologies, IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models, Simplified IOT Architecture and Core IOT, Functional Stack, Fog, Edge and Cloud in IOT, Functional blocks of an IOT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IOT-Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

Prototyping Online Components: API, Writing a New API, Real-Time Reactions, Other Protocols. Techniques for Writing Embedded Code: Memory Management, Performance and Battery Life, Libraries, Debugging.

CMRF

Eligibility Test

EARTH, ATMOSPHERIC, OCEAN AND PLANETARY

CODE: S06

UNIT I

The Earth and the Solar System:

Milky Way and the solar system. Modern theories on the origin of the Earth and other planetary bodies. Earth's orbital parameters, Kepler's laws of planetary motion, Geological Time Scale; Space and time scales of processes in the solid Earth, atmosphere and oceans. Radioactive isotopes and their applications. Meteorites Chemical composition and the Primary differentiation of the earth. Basic principles of stratigraphy. Theories about the origin of life and the nature of fossil record. Earth's gravity and magnetic fields and its thermal structure: Concept of Geoid and, spheroid. Isostasy.

Earth Materials, Surface Features and Processes: Gross composition and physical properties of important minerals and rocks; properties and processes responsible for mineral concentrations; nature and distribution of rocks and minerals in different units of the earth and different parts of India. Physiography of the Earth: weathering, erosion, transportation and deposition of Earth's material; formation of soil, sediments and sedimentary rocks; energy balance of the Earth's surface processes; physiographic features and river basins in India.

Interior of the Earth, Deformation and Tectonics

Basic concepts of seismology and internal structure of the Earth. Physico-chemical and seismic properties of Earth's interior. Concepts of stress and strain. Behaviour of rocks under stress; Folds, joints and faults. Earthquakes – their causes and measurement. Interplate and intraplate seismicity. Paleomagnetism, sea floor spreading and plate tectonics.

Oceans and Atmosphere

Hypsography of the continents and ocean floor –continental shelf, slope, rise and abyssal plains. Physical and chemical properties of sea water and their spatial variations. Residence times of elements in sea water. Ocean currents, waves and tides, important current systems, thermohaline circulation and the oceanic conveyor belt. Major water masses of the world's oceans. Biological productivity in the oceans. Motion of fluids, waves in atmospheric and oceanic systems. Atmospheric turbulence and boundary layer. Structure and chemical composition of the atmosphere, lapse rate and stability, scale height, geopotential, greenhouse gases and global warming. Cloud formation and precipitation processes, air- sea interactions on different space and time scales. Insolation and heat budget, radiation balance, general circulation of the atmosphere and ocean. Climatic and sea level changes on different time scales. Coupled ocean-atmosphere system, El Nino Southern Oscillation (ENSO). General weather systems of India: Monsoon system, cyclone and jet stream, Western disturbances and severe local convective systems, distribution of precipitation over India.

Marine and atmospheric pollution, ozone depletion.

Environmental Earth Sciences

Properties of water; hydrological cycle; water resources and management. Energy resources, uses, degradation, alternatives and management; Ecology and biodiversity. Impact of use of energy and land on the environment. Exploitation and conservation of mineral and other natural resources. Natural hazards. Elements of Remote Sensing.

UNIT II

GEOLOGY**MINERALOGY AND IGNEOUS AND METAMORPHIC PETROLOGY:**

Concept of point group, space group, reciprocal lattice, diffraction and imaging. Concepts of crystal field theory and mineralogical spectroscopy. Lattice defects (point, line and planar). Electrical, magnetic and optical properties of minerals. Bonding and crystal structures of common oxides, sulphides, and silicates. Transformation of minerals – polymorphism, polytypism, and polysomatism. Solid solution and exsolution.

Steady-state geotherms. Genesis, properties, emplacement and crystallization of magmas. Phase equilibrium studies of simple systems, effect of volatiles on melt equilibria. Magma -mixing, - mingling and -immiscibility.

Metamorphic structures and textures; isograds and facies. Mineral reactions with condensed phases, solid solutions, mixed volatile equilibria and thermo-barometry. Metamorphism of pelites, mafic -ultra mafic rocks and siliceous dolomites. Material transport during metamorphism. P-T path in regional metamorphic terrains, plate tectonics and metamorphism.

Petrogenetic aspects of important rock suites of India, such as the Deccan Traps, layered intrusive complexes, anorthosites, carbonatites, charnockites, alkaline rocks, Kimberlites, ophiolites and granitoids.

STRUCTURAL GEOLOGY AND GEOTECTONICS:

Theory of stress and strain. Behaviour of rocks under stress. Mohr circle. Various states of stress and their representation by Mohr circles. Different types of failure and sliding criteria. Geometry and mechanics of fracturing and conditions for reactivation of pre-existing discontinuities. Common types of finite strain ellipsoids. L-, L-S-, and S-tectonic fabrics. Techniques of strain analysis. Particle paths and flow patterns. Progressive strain history. Introduction to deformation mechanisms. Role of fluids in deformation processes. Geometry and analyses of brittle-ductile and ductile shear zones. Sheath folds. Geometry and mechanics of development of folds, boudins, foliations and lineations. Interference patterns of superposed fold. Fault-related folding. Gravity induced structures. Tectonic features of extensional-, compressional-, and strike-slip-terrains and relevance to plateboundaries. mantle plumes. Himalayan Orogeny; concept of super continent, their assembly and breakup.

PALEONTOLOGY AND ITS APPLICATIONS:

Theories on origin of life. Organic evolution – Punctuated Equilibrium and Phyletic Gradualism models. Mass extinctions and their causes. Application of fossils in age determination and correlation. Paleocology, Life habitats and various ecosystems, Paleobiogeography. Modes of preservation of fossils and taphonomic considerations. Types of microfossils. Environmental significance of fossils and trace fossils. Use of microfossils in interpretation of sea floor tectonism. Application of micropaleontology in hydrocarbon exploration. Oxygen and Carbon isotope studies of microfossils and their use in paleoceanographic and paleoclimatic interpretation. Important invertebrate fossils, vertebrate fossils, plant fossils and microfossils in Indian stratigraphy.

SEDIMENTOLOGY AND STRATIGRAPHY:

Classification of sediments and sedimentary rocks ; elastic, volcanoclastic and chemical. Classification of elastic rocks. Flow regimes and processes of sediment transport. Sedimentary textures and structures. Sedimentary facies and environments, reconstruction of paleoenvironments. Formation and evolution of sedimentary basins. Diagenesis of siliciclastic and carbonate rocks.

Recent developments in stratigraphic classification. Code of stratigraphic nomenclature – Stratotypes, Global Boundary Stratotype Sections and Points (GSSP). Lithostratigraphic, chronostratigraphic and biostratigraphic subdivisions. Methods of stratigraphic correlation including Shaw's Graphic correlation. Concept of sequence stratigraphy. Rates of sediment accumulation, unconformities. Facies concept in Stratigraphy – Walther's law. Methods for paleogeographic reconstruction. Earth's Climatic History. Phanerozoic stratigraphy of India with reference to the type areas– their correlation with equivalent formations in other regions. Boundary problems in Indian Phanerozoic stratigraphy.

MARINE GEOLOGY AND PALEOCEANOGRAPHY:

Morphologic and tectonic domains of the ocean floor. Structure, composition and mechanism of the formation of oceanic crust. Hydrothermal vents. Ocean margins and their significance. Ocean Circulation, Coriolis effect and Ekman spiral, convergence, divergence and upwelling, El Nino. Indian Ocean Dipole Thermohaline circulation and oceanic conveyor belt. Formation of Bottom waters; major water masses of the world's oceans. Oceanic sediments: Factors controlling the deposition and distribution of oceanic sediments; geochronology of oceanic sediments, diagenetic changes in oxic and anoxic environments. Tectonic evolution of the ocean basins. Mineral resources. Paleoceanography – Approaches to paleoceanographic reconstructions; various proxy indicators for paleoceanographic interpretation. Reconstruction of monsoon variability by using marine proxy records. Opening and closing of ocean gateways and their effect on circulation and climate during the Cenozoic. Sea level processes and Sea level changes. Methods of paleo Sea Surface temperature. Quantifications.

UNIT III

GEOCHEMISTRY:

Atomic Structure and properties of elements, the Periodic Table; ionic substitution in minerals; Phase rule and its applications in petrology, thermodynamics of reactions involving pure phases, ideal and non-ideal solutions, and fluids; equilibrium and distribution coefficients. Nucleation and diffusion processes in igneous, metamorphic and sedimentary environments, redox reactions and Eh- pH diagrams and their applications. Mineral/mineral assemblages as “sensors” of ambient environments. Geochemical studies of aerosols, surface-, marine-, and ground waters. Radioactive decay schemes and their application to geochronology and petrogenesis. Stable isotopes and their application to earth system processes; geochemical differentiation of the earth; geochemical cycles.

ECONOMIC GEOLOGY:

Magmatic, hydrothermal and surface processes of ore formation. Metallogeny and its relation to crustal evolution; Active ore-forming systems, methods of mineral deposit studies including ore microscopy, fluid inclusions and isotopic systematics; ores and metamorphism- cause and effect relationships. Geological setting, characteristics, and genesis of ferrous, base and noble metals. Origin, migration and entrapment of petroleum; properties of source and reservoir rocks; structural, stratigraphic and combination traps. Methods of petroleum exploration. Concepts of petrophysics, Petroliferous basins of India. Origin of peat, lignite, bitumen and anthracite. Classification, rank and grading of coal; coal petrography, coal resources of India. Gas hydrates and coal bed methane. Nuclear and non- conventional energy resources.

PRECAMBRIAN GEOLOGY AND CRUSTAL EVOLUTION:

Evolution of lithosphere, hydrosphere, atmosphere, biosphere, and cryosphere; lithological, geochemical and stratigraphic characteristics of granite – greenstone and granulite belts. Stratigraphy and geochronology of the cratonic nuclei, mobile belts and Proterozoic sedimentary basins of India. Life in Precambrian. Precambrian – Cambrian boundary with special reference to India.

QUATERNARY GEOLOGY:

Definition of Quaternary. Quaternary Stratigraphy – Oxygen Isotope stratigraphy, biostratigraphy and magnetostratigraphy. Quaternary climates – glacial-interglacial cycles, eustatic changes, proxy indicators of paleoenvironmental/ paleoclimatic changes - land, ocean and cryosphere (ice core studies). Responses of geomorphic systems to climate, sea level and tectonics on variable time scales in the Quaternary, Quaternary dating methods, – radiocarbon, Uranium series, Luminescence, Amino- acid. Quaternary stratigraphy of India– continental records (fluvial, glacial, aeolian, palaeosols and duricrust); marine records; continental-marine correlation of Quaternary record.

Evolution of man and Stone Age cultures. Plant and animal life in relation to glacial and interglacial cycles during Quaternary.

Tectonic geomorphology, neotectonics, active tectonics and their applications to natural hazard assessment.

APPLIED GEOLOGY:

- **Remote Sensing and GIS:** Elements of photogrammetry, elements of photo-interpretation, electromagnetic spectrum, emission range, film and imagery, sensors, geological interpretations of air photos and imageries. Global Positioning Systems (GPS). GIS - data structure, attribute data, thematic layers and query analysis.
- **Engineering Geology:** Engineering properties of rocks and physical characteristics of building stones, concretes and other aggregates. Geological investigations for construction of dams, bridges, highways and tunnels. Remedial measures. Mass movements with special emphasis on landslides and causes of hillslope instability. Seismic design of buildings.
- **Mineral Exploration:** Geological, geophysical, geochemical and geo-botanical methods of surface and sub-surface exploration on different scales. Sampling, assaying and evaluation of mineral deposits.
- **Hydrogeology:** Groundwater, Darcy’s law, hydrological characteristics of aquifers, hydrological cycle. Precipitation, evapotranspiration and infiltration processes. Hydrological classification of water-bearing formations. Fresh and salt-water relationships in coastal and inland areas. Groundwater exploration and water pollution. Groundwater regimes in India.

PHYSICAL GEOGRAPHY

- 1) **Geomorphology:** Concepts in geomorphology. Historical and process Geomorphology. Landforms in relation to climate, rock type, structure and tectonics. Processes – weathering, pedogenesis, mass movement, erosion, transportation and deposition. Geomorphic processes and landforms – fluvial, glacial, aeolian, coastal and karst. River forms and processes – stream flow, stage- discharge relationship; hydrographs and flood frequency analysis. Submarine relief. Geomorphology and topographic analysis including DEM, Environmental change– causes, effects on processes and landforms. Extra-terrestrial geomorphology.
- 2) **Climatology:** Fundamental principles of climatology. Earth’s radiation balance; latitudinal and seasonal variation of insolation, temperature, pressure, wind belts, humidity, cloud formation and precipitation, water balance. Air masses, monsoon, Jet streams, tropical cyclones, and ENSO. Classification of climates – Koppen’s and Thornthwaite’s scheme of classification. Climate change.
- 3) **Bio-geography:** Elements of biogeography with special reference to India; environment, habitat, plant-animal association; zoo-geography of India; Biomes, elements of plant geography, distribution of forests and major plant communities. Distribution of major animal communities. Conservation of forests. Wildlife sanctuaries and parks.
- 4) **Environmental Geography:** Man-land relationship. Resources – renewable and non-renewable. Natural and man-made hazards – droughts, floods, cyclones, earthquakes, landslides, tsunamis. Ecological balance, environmental pollution and deterioration.
- 5) **Geography of India:** Physiography, drainage, climate, soils and natural resources – the Himalaya, Ganga-Brahmaputra Plains, and peninsular India Precambrian shield, the Gondwana rift basins, Deccan Plateau. Indian climatology with special reference to seasonal distribution and variation of temperature, humidity, wind and precipitation; Climate zones of India. Agricultural geography of India. Population – its distribution and characteristics. Urbanization and migration. Environmental problems and issues.

UNIT - IV**GEOFYSICS**

Signal Processing: Continuous and discrete signals; Fourier series; auto and cross correlations, linear time invariant systems with deterministic and random inputs; band limited signal and sampling theorem; Fourier and Fast Fourier transforms; Z-transform; convolution; Filters: discrete and continuous, recursive, non-recursive, optimal and inverse filters; deconvolution; fractal analysis.

Field theory: Newtonian potential; Laplace and Poisson’s equations; Green’s Theorem; Gauss’ law; Continuation integral; equivalent stratum; Maxwell’s equations and electromagnetic theory; Displacement potential, Helmholtz’s theorem and seismic wave propagation.

Numerical analysis and inversion: Numerical differentiation and integration, finite element, and finite difference techniques; Simpson’s rules; Gauss’ quadrature formula; initial value problems; pattern recognition in Geophysics. Well posed and ill-posed problems; method of least squares; direct search and gradient methods; generalized inversion techniques; singular value decomposition; global optimization.

Gravity and Magnetic fields of the earth: Normal gravity field; Clairaut’s theorem; Shape of the earth; deflection of the vertical, geoid, free-air, Bouguer and isostatic anomalies, isostatic models for local and regional compensation. Geomagnetic field, secular and transient variations and their theories; palaeomagnetism, construction of polar wandering curves.

Plate Tectonics and Geodynamics: Marine magnetic anomalies, sea floor spreading; mid- oceanic ridges and geodynamics; plate tectonics hypothesis; plate boundaries and seismicity. Heat flow mechanisms, thermal modeling of earth, core-mantle convection and mantle plumes.

Seismology Elastic theory: Seismometry: short period, long period, broad band and strong motion; elements of earthquake seismology; seismic sources: faulting source, double couple hypothesis, seismic moment tensor, focal mechanism and fault plane solutions; seismic gaps; seismotectonics and structure of the earth; Himalayan and stable continental region earthquakes, reservoir induced seismicity; seismic hazards; earthquake prediction, travel time residuals, velocity anomalies, seismic tomography.

Gravity and Magnetic Methods: Gravimeters and magnetometers; data acquisition from land, air and ship; corrections and reduction of anomalies; ambiguity; regional and residual separation; continuation and derivative calculations; interpretation of anomalies of simple geometric bodies, single pole, sphere, horizontal cylinder, sheet, dyke and fault. Forward modelling and inversion of arbitrary shaped bodies and 2-D, 3-D interfaces. Interpretations in frequency domain.

Electrical and Electromagnetic Methods: Electrical profiling and sounding, typical sounding curves, pseudo-sections; resistivity transform and direct interpretation; induced polarization methods. Electromagnetic field techniques; elliptic polarization, in-phase and out of phase components, horizontal and vertical loop methods; interpretation; VLF (very low frequency); AFMAG (Audio frequency magnetic) methods; and central frequency sounding; transient electromagnetic methods; magneto-telluric method; geomagnetic depth sounding.

Seismic Methods: Generalized Snell's Law; Ray theory; reflection, refraction, diffraction; Zoeppritz's equation; seismic energy sources; detectors; seismic noises and noise profile analysis; seismic data recording, reduction to a datum and weathering corrections; Interpretation of refraction and reflection data; CDP/CMP; velocity analysis, F-K filtering, stacking, deconvolution, migration before and after stack; bright spot analysis; wavelet processing; attenuation studies, shear waves, AVO; VSP; introduction to 3D seismics; seismic stratigraphy.

Well logging: Open hole, cased hole and production logging; Electrical logs; lateral, induction, temperature, S.P; porosity logs; sonic, density, neutron; natural gamma; determination of formation factor, porosity, permeability, density, water saturation, lithology; logging while drilling.

UNIT V

METEOROLOGY

Climatology: Same as under Geography

Physical Meteorology: Thermal structure of the atmosphere and its composition. Radiation: basic Laws - Rayleigh and Mie scattering, multiple scattering, radiation from the sun, solar constant, effect of clouds, surface and planetary albedo. Emission and absorption of terrestrial radiation, radiation windows, radiative transfer, Greenhouse effect, net radiation budget; Thermodynamics of dry and moist air: specific gas constant, Adiabatic and isentropic processes, entropy and enthalpy, Moisture variables, virtual temperature; Clausius – Clapeyron equation, adiabatic process of moist air; thermodynamic diagrams: Hydrostatic equilibrium: Hydrostatic equation, variation of pressure with height, geopotential, standard atmosphere, altimetry. Vertical stability of the atmosphere: Dry and moist air parcel and slice methods. Tropical convection. Atmospheric optics - visibility - optical phenomenon - rainbows, haloes, corona, mirage.

Atmospheric Electricity: Fair weather electric field in the atmosphere and potential gradients, ionization in the atmosphere. Electrical fields in thunderstorms, theories of thunderstorm electrification - Structure of lightning flash-mechanism of earth-atmospheric charge balance-role of thunderstorms.

Cloud Physics: Cloud classification, condensation nuclei, growth of cloud drops and ice-crystals, precipitation mechanisms: Bergeron, Findeisen process, coalescence process – Precipitation of warm and mixed clouds, artificial precipitation, hail suppression, fog and cloud – dissipation, radar observation of clouds and precipitation, radar equation, rain drop spectra, radar echoes of hail storm and tornadoes, radar observation of hurricanes, measurements of rainfall by radar.

Dynamic Meteorology: Basic equations and fundamental forces: Pressure, gravity, centripetal and Coriolis forces, continuity equation in Cartesian and isobaric coordinates. Momentum equation Cartesian and spherical coordinates; scale analysis, inertial flow, geostrophic and gradient winds, thermal wind. Divergence and vertical motion Rossby, Richardson, Reynolds and Froude numbers. Circulation, vorticity and divergence; Bjerknes circulation theorem and applications, vorticity and divergence equations, scale analysis, potential vorticity, stream function and velocity potential. Atmospheric turbulence: Mixing length theory, planetary boundary layer equations, surface layer, Ekman layer, eddy transport of heat, moisture and momentum, Richardson criterion; Linear Perturbation Theory: Internal and external gravity waves, inertia waves, gravity waves, Rossby waves, wave motion in the tropics, barotropic and baroclinic instabilities. Atmospheric Energetics: Kinetic, potential and internal energies – conversion of potential and internal energies into kinetic energy, available potential energy.

Numerical Weather Prediction: computational instability, filtering of sound and gravity waves, filtered forecast equations, barotropic and equivalent barotropic models, two parameter baroclinic model, relaxation method. Multi-layer primitive equation models. Short, medium and long range weather prediction. Objective analysis; Initialization of the data for use in weather prediction models; data assimilation techniques, application of satellite in NWP (Numerical Weather Prediction) and remotely sensed data.

General Circulation and Climate Modelling: Observed zonally symmetric circulations, meridional circulation models, mean meridional and eddy transport of momentum and energy, angular momentum and energy budgets; zonally asymmetric features of general circulation; standing eddies; east-west circulations in tropics: climate variability and forcings; feedback processes, low frequency variability, MJO (Madden-Julian oscillation), ENSO, QBO (quasi-biennial oscillation) and sunspot cycles. Basic principles of general circulation modelling; grid-point and spectral GCMs; role of the ocean in climate modelling; interannual variability of ocean fields (SST, winds, circulation, etc.) and its relationship with monsoon, concepts of ocean – atmosphere coupled models.

Synoptic Meteorology: Weather observations and transmission, synoptic charts, analysis of surface, upper air another derivative chart, stream-lines, isotachs and contour analysis; tilt and slope of pressure/weather systems with height. Synoptic weather forecasting, prediction of weather elements such as rain, maximum and minimum temperature and fog; hazardous weather elements like thunderstorms, duststorms, tornadoes. Tropical meteorology: Trade wind inversion, ITCZ; monsoon trough tropical cyclones, their structure and development theory; monsoon depressions; tropical easterly jet stream; low level jets, Somali jet, waves in easterlies; western disturbances; SW and NE monsoons; synoptic features associated with onset, withdrawal, break active and weak monsoons and their prediction. Air masses and fronts: sources, origin and classification of air masses; and fronts, frontogenesis and frontolysis; structure of cold and warm fronts; weather systems associated with fronts. Extra-tropical synoptic scale features: jet streams, extratropical cyclones and anticyclones.

Aviation Meteorology: Role of meteorology in aviation, weather hazards associated with take off cruising and landing, inflight – icing, turbulence, visibility, fog, clouds, rain, gusts, wind shear and thunderstorms, now-casting and very short range forecasting.

Satellite Meteorology: Meteorological satellites – Polar orbiting and geostationary satellites, visible and infrared radiometers, multiscanner radiometers; identification of synoptic systems, fog and sandstorms, detection of cyclones, estimation of SST, cloud top temperatures, winds and rainfall: temperature and humidity soundings.

UNIT VI

OCEAN SCIENCES

1) Physical Oceanography: T-S diagrams; mixing processes in the oceans; characteristics of important water masses.

Wind generated waves in the oceans; their characteristics; shallow and deep water waves. Propagation, refraction, and reflection of waves. Wave spectrum, principles of wave forecasting. Tide-producing forces and their magnitudes; prediction of tides by the harmonic method; tides and tidal currents in shallow seas, estuaries and rivers. Factors influencing coastal processes; transformation of waves in shallow water; effects of stratification; effect of bottom friction, phenomena of wave reflection, refraction and diffraction; breakers and surf; littoral currents; wave action on sediments – movement to beach material; rip currents; beach stability, ocean beach nourishment; harbour resonance; seiches; tsunami; interaction of waves and structure. Estuaries: classification and nomenclature; tides in estuaries; estuarine circulation and mixing; depth – averaged and breadth – averaged models; sedimentation in estuaries; salinity intrusion in estuaries; effect of stratification; coastal pollution; mixing and dispersal of pollutants in estuaries and near-shore areas; coastal zone management.

The global wind system; action of wind on ocean surface; Ekman's theory; Sverdrup, Stommel and Munk's theories; upwelling and sinking with special reference to the Indian ocean. Inertial currents; divergences and convergences; geostrophic motion; barotropic and baroclinic conditions; oceanic eddies, relationship between density, pressure and dynamic topography; relative and slope currents. Wind driven coastal currents; typical scales of motion in the ocean.

Characteristics of the global conveyor belt circulation and its causes.

Formation of subtropical gyres; western boundary currents; equatorial current systems; El Nino; monsoonal winds and currents over the North Indian Ocean; Somali current; southern ocean. Upwelling process in the Arabian Sea.

2) Chemical Oceanography: Composition of seawater – Classification of elements based on their distribution; major and minor elements, their behavior and chemical exchanges across interfaces and residence times in seawater.

Element chemistry in atypical conditions-estuaries, hydrothermal vents, anoxic basins, HNLC waters, sediment pore fluid and anthropogenic inputs.

Chemical and biological interactions – Ionic interactions; biochemical cycling of nutrients, trace metals and organic matter. Air-sea exchange of important biogenic dissolved gases; carbon dioxide- carbonate system; alkalinity and control of pH; biological pump.

Factors affecting sedimentary deposits-CaCO₃, Silicate, Manganese nodules, phosphorites and massive single deposits.

3) Geological Oceanography: Same topics as under subhead “Marine Geology & paleo- oceanography”

4) Biological Oceanography: Classification of the marine environment and marine organisms.

Physio-chemical factors affecting marine life – light, temperature, salinity, pressure, nutrients, dissolved gases; adaptation and biological processes.

Primary and secondary production; factors controlling phytoplankton and zooplankton abundance and diversity; nekton and fisheries oceanography; benthic organisms; coastal marine communities and community ecology – estuaries, coral reefs and mangrove communities, deep-sea ecology including hydrothermal vent communities.

Energy flow and mineral cycling – energy transfer and transfer efficiencies through different trophic levels; food webs including the microbial loop.

Human impacts on marine communities; impacts of climate change on marine biodiversity. Impact of pollution on marine environments including fisheries.

CMRF

Subject : ENVIRONMENTAL SCIENCES

Code: S07

Unit-I: Fundamentals of Environmental Sciences

Definition, Principles and Scope of Environmental Science. Environmental education and awareness. Environmental ethics.

Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere.

Laws of thermodynamics, heat transfer processes, mass and energy transfer across various interfaces, material balance.

Meteorological parameters - pressure, temperature, precipitation, humidity, mixing ratio, saturation mixing ratio, radiation and wind velocity, adiabatic lapse rate, environmental lapse rate. Wind roses.

Interaction between Man and Environment. Environmental susceptibility, utilization of resources, man-made imbalance in the environment. Biogeographic provinces of the world and agro-climatic zones of India. Concept of sustainable development.

Natural resources and their assessment. Remote Sensing and GIS: Principles of remote sensing and GIS. Digital image processing and ground truthing. Application of remote sensing and GIS in land cover/land use planning and management (urban sprawling, vegetation study, forestry, natural resource), waste management and climate change.

Environmental Chemistry

Fundamentals of Environmental Chemistry: Classification of elements, Stoichiometry, Gibbs' energy, chemical potential, chemical kinetics, chemical equilibria, solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, radioisotopes.

Composition of air. Particles, ions and radicals in the atmosphere. Chemical speciation. Chemical processes in the formation of inorganic and organic particulate matters, thermochemical and photochemical reactions in the atmosphere, Oxygen and Ozone chemistry. Photochemical smog. Hydrological cycle.

Biogeochemical cycles – nitrogen, carbon, phosphorus and sulphur.

Toxic chemicals: Pesticides and their classification and effects. Biochemical aspects of heavy metals (Hg, Cd, Pb, Cr) and metalloids (As, Se). CO, O₃, PAN, VOC and POP. Carcinogens in the air.

Principles of analytical methods: Titrimetry, Gravimetry, Bomb Calorimetry, Chromatography (Paper Chromatography, TLC, GC and HPLC), Flame photometry, Spectrophotometry (UV-VIS, AAS, ICP-AES, ICP-MS), Electrophoresis, XRF, XRD, NMR, FTIR, GC-MS, Microscopy SEM, TEM.

Unit-II: Environmental Biology

Ecology as an inter-disciplinary science. Origin of life and speciation. Human Ecology and Settlement.

Ecosystem Structure and functions: Structures - Biotic and Abiotic components. Functions - Energy flow in ecosystems, energy flow models, food chains and food webs. Ecological pyramids. Ecological succession. Biodiversity - Species diversity, genetic diversity and ecosystem diversity Concept of ecotone, edge effects, ecological habitats and niche. Ecosystem stability and factors affecting stability. Ecosystem services.

Basis of Ecosystem classification. Types of Ecosystem: Desert (hot and cold), forest (tropical, deciduous and conifers), Grasslands wetlands, Aquatic marine and freshwater estuarine (mangrove),

Biomes: Concept, classification and distribution. Characteristics of different biomes: Tundra, Taiga, Grassland, Deciduous forest biome, Highland Icy Alpine Biome, Chapparal, Savanna, Tropical Rain forest.

Population ecology: Characteristics of population, concept of carrying capacity, population growth and regulations. Population fluctuations, dispersion and metapopulation. Concept of 'r' and 'k' species. Keystone species.

Community ecology: Definition, community concept, types and interaction - predation, herbivory, parasitism and allelopathy. Biological invasions.

Biodiversity and its conservation: Definition, types, importance of biodiversity and threats to biodiversity. Concept and basis of identification of 'Hotspots'; hotspots in India. Measures of biodiversity. Strategies for biodiversity conservation: in situ, ex situ and in vitro conservation. National parks, Sanctuaries, Protected areas and Sacred groves in India. Concepts of gene pool, biopiracy and bio-prospecting. Concept of restoration ecology. Extinct, Rare, Endangered and Threatened flora and fauna of India.

Environmental Geosciences

Origin of earth. Primary geochemical differentiation and formation of core, mantle, crust, atmosphere and hydrosphere. Concept of minerals and rocks. Formation of igneous and metamorphic rocks. Controls on formation of landforms - tectonic including plate tectonic and climatic. Concept of steady state and equilibrium, Energy budget of the earth. Earth's thermal environment and seasons. Coriolis force, pressure gradient force, frictional force, geo-strophic wind field, gradient wind. Climates of India, western disturbances, Indian monsoon, droughts, El Nino, La Nina. Concept of residence time and rates of natural cycles. Geophysical fields.

Weathering including weathering reactions, erosion, transportation and deposition of sediments. Soil forming minerals and process of soil formation, identification and characterization of clay minerals, Soil physical and chemical properties, soil types and climate control on soil formation, Cation exchange capacity and mineralogical controls.

Geochemical classification of elements, abundance of elements in bulk earth, crust, hydrosphere and biosphere. Partitioning of elements during surficial geologic processes, Geochemical recycling of elements. Paleoclimate.

Distribution of water in earth, hydrology and hydrogeology, major basins and groundwater provinces of India, Darcy's law and its validity, groundwater fluctuations, hydraulic conductivity, groundwater tracers, land subsidence, effects of excessive use of groundwater, groundwater quality. Pollution of groundwater resources, Ghyben-Herzberg relation between fresh-saline water.

Natural resource exploration and exploitation and related environmental concerns. Historical perspective and conservation of non-renewable resources.

Disaster management: Natural Hazards: Catastrophic geological hazards - floods, landslides, earthquakes, volcanism, avalanche, tsunami and cloud bursts. Prediction of hazards and mitigation of their impacts.

Unit-III: Energy and Environment

Sun as source of energy; solar radiation and its spectral characteristics. Fossil fuels: classification, composition, physico-chemical characteristics and energy content of coal, petroleum and natural gas. Shale oil, Coal bed Methane, Gas hydrates. Gross-calorific value and net-calorific value.

Principles of generation of hydro-power, tidal energy, ocean thermal energy conversion, wind power, geothermal energy, solar energy (solar collectors, photo-voltaic modules, solar ponds).

Nuclear energy - fission and fusion, Nuclear fuels, Nuclear reactor – principles and types.

Bioenergy: methods to produce energy from biomass.

Environmental implications of energy use; energy use pattern in India and the world, emissions of CO₂ in developed and developing countries including India, radiative forcing and global warming. Impacts of large scale exploitation of solar, wind, hydro and nuclear energy sources.

Environmental Pollution and Control

Air Pollution:

Sources and types of Pollutants - Natural and anthropogenic sources, primary and secondary pollutants. Criteria air pollutants. Sampling and monitoring of air pollutants (gaseous and particulates); period, frequency and duration of sampling. Principles and instruments for measurements of (i) ambient air pollutants concentration and (ii) stack emissions. Indian National Ambient Air Quality Standards. Impact of air pollutants on human health, plants and

materials. Acid rain. Dispersion of air pollutants. Mixing height/depth, lapse rates, Gaussian plume model, line source model and area source model. Control devices for particulate matter: Principle and working of: settling chamber, centrifugal collectors, wet collectors, fabric filters and electrostatic precipitator. Control of gaseous pollutants through adsorption, absorption, condensation and combustion including catalytic combustion. Indoor air pollution, Vehicular emissions and Urban air quality.

Noise Pollution:

Sources, weighting networks, measurement of noise indices (Leq, L10, L90, L50, LDN, TNI). Noise dose and Noise Pollution standards. Noise control and abatement measures: Active and Passive methods. Vibrations and their measurements. Impact of noise and vibrations on human health.

Water Pollution:

Sources of water - Types and sources of water pollution. Impact on humans, plants and animals. Measurement of water quality parameters: sampling and analysis for pH, EC, turbidity, TDS, hardness, chlorides, salinity, DO, BOD, COD, nitrates, phosphates, sulphates, heavy metals and organic contaminants. Microbiological analysis – MPN. Indian standards for drinking water (IS:10500, 2012). Drinking water treatment: Coagulation and flocculation, Sedimentation and Filtration, Disinfection and Softening. Wastewater Treatment: Primary, Secondary and tertiary. Advanced treatment methods. Common effluent treatment plant.

Soil Pollution:

Physico-chemical and biological properties of soil (texture, structure, inorganic and organic components). Analysis of soil quality. Soil Pollution control. Industrial effluents and their interactions with soil components. Soil micro-organisms and their functions - degradation of pesticides and synthetic fertilizers.

Thermal, Marine Pollution and Radioactive:

Sources of Thermal Pollution, Heat Islands, causes and consequences. Sources and impact of Marine Pollution. Methods of Abatement of Marine Pollution. Coastal management. Radioactive pollution – sources, biological effects of ionizing radiations, radiation exposure and radiation standards, radiation protection.

Concept of Industrial Ecology.

Toxicology and Microbiology: Absorption, distribution and excretion of toxic agents, acute and chronic toxicity, concept of bioassay, threshold limit value, margin of safety, therapeutic index, biotransformation. Major water borne diseases and air borne microbes.

Environmental Biotechnology: Bioremediation – definition, types and role of plants and microbes for in situ and ex situ remediation. Bioindicators, Biofertilizers, Biofuels and Biosensors.

Unit IV: Solid and Hazardous Waste Management

Solid Waste - types and sources. Solid waste characteristics, generation rates, solid waste components, proximate and ultimate analyses of solid wastes. Three R's

Solid waste collection and transportation: container systems - hauled and stationary, layout of collection routes, transfer stations and transportation.

Solid waste processing and recovery – Recycling, recovery of materials for recycling and direct manufacture of solid waste products. Electrical energy generation from solid waste (Fuel pellets, Refuse derived fuels), composting and vermicomposting, biomethanation of solid waste. Disposal of solid wastes – sanitary land filling and its management, incineration of solid waste.

Hazardous waste – Types, characteristics and health impacts. Hazardous waste management: Treatment Methods – neutralization, oxidation reduction, precipitation, solidification, stabilization, incineration and final disposal. e-waste: classification, methods of handling and disposal.

Fly ash: sources, composition and utilisation.

Plastic waste: sources, consequences and management.

Environmental Assessment, Management and Legislation Aims and objectives of Environmental Impact Assessment (EIA). Environmental Impact Statement (EIS) and Environmental Management Plan (EMP). EIA Guidelines. Impact Assessment Methodologies. Procedure for reviewing EIA of developmental projects. Life-cycle analysis, cost-benefit analysis. Guidelines for Environmental Audit. Environmental Planning as a part of EIA and Environmental Audit. Environmental Management System Standards (ISO14000 series). EIA Notification, 2006 and amendments from time to time. Eco-labeling schemes.

Risk Assessment - Hazard identification, Hazard accounting, Scenarios of exposure, Risk characterization and Risk management.

Overview of Environmental Laws in India: Constitutional provisions in India (Article 48A and 51A). Wildlife Protection Act, 1972 amendments 1991, Forest Conservation Act, 1980, Indian Forest Act, Revised 1982, Biological Diversity Act, 2002, Water (Prevention and Control of Pollution) Act, 1974 amended 1988 and Rules 1975, Air (Prevention and Control of Pollution) Act, 1981 amended 1987 and Rules 1982, Environmental (Protection) Act, 1986 and Rules 1986, Motor Vehicle Act, 1988, The Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016, The Plastic Waste Management Rules, 2016, The Bio-Medical Waste Management Rules, 2016, The Solid Waste Management Rules, 2016, The e-waste (Management) Rules 2016, The Construction and Demolition Waste Management Rules, 2016, The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000, The Batteries (Management and Handling) Rules, 2010 with Amendments, The Public Liability Insurance Act, 1991 and Rules 1991, Noise Pollution (Regulation and Control) Rules, 2000, Coastal Regulation Zones (CRZ) 1991 amended from time to time.

National Forest Policy, 1988, National Water Policy, 2002, National Environmental Policy, 2006.

Environmental Conventions and Agreements: Stockholm Conference on Human Environment 1972, Montreal Protocol, 1987, Conference of Parties (COPs), Basel Convention (1989, 1992), Ramsar Convention on Wetlands (1971), Earth Summit at Rio de Janeiro, 1992, Agenda-21, Global Environmental Facility (GEF), Convention on Biodiversity (1992), UNFCCC, Kyoto Protocol, 1997, Clean Development Mechanism (CDM), Earth Summit at Johannesburg, 2002, RIO+20, UN Summit on Millennium Development Goals, 2000, Copenhagen Summit, 2009. IPCC, UNEP, IGBP.

Unit V: Statistical Approaches and Modelling in Environmental Sciences

Attributes and Variables: types of variables, scales of measurement, measurement of Central tendency and Dispersion, Standard error, Moments – measure of Skewness and Kurtosis, Basic concept of probability theory, Sampling theory, Distributions - Normal, log-normal, Binomial, Poisson, t, 2 and F-distribution. Correlation, Regression, tests of hypothesis (t-test, 2-test ANOVA: one-way and two-way); significance and confidence limits.

Approaches to development of environmental models; linear, simple and multiple regression models, validation and forecasting. Models of population growth and interactions: Lotka-Volterra model, Leslie's matrix model.

Contemporary Environmental Issues

Global Environmental Issues – Biodiversity loss, Global warming, acid rain, greenhouse effect, Climate change, Ozone layer depletion. Sea level rise. International efforts for environmental protection.

National Action Plan on Climate Change (Eight National missions – National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining the Himalayan Ecosystem, National Mission for a 'Green India', National Mission for Sustainable Agriculture, National Mission on Strategic Knowledge for Climate Change).

Current Environmental Issues in India: Environmental issues related to water resource projects - Narmada dam, Tehri dam, Almatti dam, Cauvery and Mahanadi, Hydro-power projects in Jammu & Kashmir, Himachal and North-Eastern States.

Sustainable development, human population explosion, food shortage and distribution pattern and food security, urbanization and related problems, consumerism and waste generation, role of individuals in environmental issues and pollution.

Water conservation-development of watersheds, Rain water harvesting and ground water recharge.

National river conservation plan – Namami Gange and Yamuna Action Plan.

Eutrophication and restoration of lakes. Conservation of wetlands, Ramsar sites in India.

Soil erosion, reclamation of degraded land, desertification and its control.

Climate change - adaptability, energy security, food security and sustainability.

Forest Conservation – Chipko movement, Appiko movement, Silent Valley movement and Gandhamardhan movement. People Biodiversity register.

Wild life conservation projects: Project tiger, Project Elephant, Crocodile Conservation, GOI-UNDP Sea Turtle project, Indo-Rhino vision.

Carbon sequestration and carbon credits.

Waste Management – Swachha Bharat Abhiyan.

Sustainable Habitat: Green Building, GRIHA Rating Norms.

Vehicular emission norms in India.

Epidemiological Issues: Fluorosis, Arsenocosis, Goitre, Environmental Disasters: Minnamata Disaster, Love Canal Disaster, Bhopal

Gas Disaster, 1984, Chernobyl Disaster, 1986, Fukusima Daiichi nuclear disaster, 2011.

CMRF**Subject: Home Science****CODE: S08****UNIT-I : FOOD SCIENCE AND FOOD SERVICE MANAGEMENT**

- Food science and nutrition.
- Properties of food – physical and chemical properties
- Quality evaluation of foods- objectives and subjective.
- Effects of cooking and processing techniques on nutritional components and other physical parameters, food preservation and application.
- Food pigments and additives.
- Food standards, microbiological safety of food, HACCP, food packaging.
- Perspectives of food service-menu planning, food cost analysis.
- New product development - nano technology
- Food service management of institutional level-hospital, educational institutions, social and special institutions
- Research methods-fundamental issues, concept, need relevance, scope and ethics in research

NUTRITION AND DIETETICS

- Food groups – balanced diet, food pyramid, macro and micro nutrition.
- Nutrients-role of nutrients in the body, nutrient deficiencies and requirements for Indians.
- Public health nutrition
- Nutrition through life span-physiological changes, growth and development from conception to adolescence, nutritional needs and dietary guidelines for adequate nutrition through life cycle, nutrition concerns.
- Community nutrition, sports nutrition, nutrition in emergencies and disasters.
- Nutritional assessment-methods and techniques.
- Nutritional intervention-national nutrition policies and programme, food and nutrition security.
- Clinical and therapeutic nutrition.
- Diet counseling and management.
- Research methods- research designs, principles and purpose of research

Unit-II: TEXTILES

- Textile terminologies- fibre, yarn, weave, fabric etc., classification of fibers, yarns and weaves, Identification of fibers and weaves.
- Manufacturing process of major natural and manmade fibres, properties and their end uses.
- Different methods of fabric construction-woven, knitted and non woven fabrics, their properties and end uses.
- Textiles finishes-classification, processing and purposes of finishes.
- Dyeing and printing-classification, method of block printing, tie and dye, batik, roller printing, screen printing, discharge, heat transfer printing and digitized printing.

- Traditional textiles of India-embroidered textiles, printed textiles, woven textiles, dyed textiles of various regions in India. Identification on the basis of fibre content, technique, motif, colour and designed.
- Textile Testing and quality control-need of testing, sampling method, techniques of testing fibres, yarn, fabrics and garments. Testing of colour- fastness, shrinkage, pilling and GSM of fabrics.
- Textile and environment-banned dyes, eco-friendly textiles, contamination and effluent treatment, Eco-label and eco marks.
- Recent developments in textiles and apparels- nano textiles, technical textiles, occupational clothing, zero waste designing, up cycling and recycling.
- Research methods-types of research, descriptive, survey, historical, qualitative, quantitative, analytical and action research

APPAREL DESIGNING

- Body measurements-procedure, need, figure types and anthropometry.
- Equipments and tools used for manufacturing garments-advancements and attachments used for sewing machine. Types of machines used and their parts.
- Elements and principles of design and its application to apparel. Illustrations and parts of garments.
- Fashion-Terminologies, fashion cycle, fashion theories, fashion adoption, fashion forecasting and factors affecting fashion.
- Pattern making-drafting, draping and flat pattern making techniques, pattern alteration and dart manipulation techniques.
- Apparel manufacturing-terminology used, seams, techniques and machines used, process of fabric to apparel manufacture.
- Apparel Quality testing-Quality standards and specification, Quality parameters and defects of fabrics and garments.
- Care and maintenance of clothing-principles of washing, laundry agents, storage techniques care labels and symbols.
- Selection of clothing for different age groups. Selection of fabrics for different and uses.
- Research methods-hypothesis testing, types and scope

UNIT- III: RESOURCE MANAGEMENT AND CONSUMER ISSUES

- Management-concept, approaches, management of time, energy, money, space, motivating factors, motivation theories, decision making.
- Functions of management-planning, supervision, controlling, organizing, evaluation, family life cycle-stages, availability and use of resources.
- Resources-classification, characteristics, factors affecting use, resource conservation, time management, work simplification techniques, classes of change, fatigue and its management.

- Management of natural resources-land, forest, water, air, water harvesting, municipal solid waste management, concept of sustainable development, SDGs.
- Money management-family income, types, supplementation, budgeting, household accounts, family savings and investment, tax implications.
- Human resource management- functions, need, human resource development- challenges, functions, manpower planning, training need assessment, training methodologies, training evaluation.
- Consumer-definition, role, rights and responsibilities, consumer behavior, consumer problems, education and empowerment.
- Consumer protection- consumer organization, cooperatives, alternative redressal, standardization, standard marks, quality control, buying aids, consumer legislation.
- Entrepreneurship-concept, process, barriers, entrepreneurial motivation, challenges, enterprise setting, project planning and appraisal, enterprise management.
- Research methods-sampling techniques, types of sampling, sampling procedures, probability and non probability sampling

HOUSING AND INTERIOR DESIGN

- Design fundamentals – elements of art, principles of design, principles of composition.
- Colour - dimensions of colour, psychological effects of colour, colour schemes, factors affecting use of colour.
- Space planning and design-housing need and important, principles of planning spaces, types of house plans, economy in construction, planning for different income groups.
- Building regulations-norms and standards, zoning, housing for special groups and areas, housing finance.
- Housing and environment- building materials- impact on environment, green rating systems, energy efficiency in buildings, energy auditing, indices of indoor comfort.
- Energy as a resource- conventional and non- conventional sources, renewable /non- renewable energy, energy management, national efforts on energy conservation.
- Product design - design thinking process, diffusion and innovation, design communication, ergonomic considerations.
- Ergonomics - significance, scope, anthropometry, man, machine, environment relationship, factors affecting physiological cost of work, body mechanics, functional design of work place, time and motion study, energy studies.
- Furniture and furnishing - historical perspectives, architectural styles, contemporary trends, wall finishes, window and window treatments.
- Research methods-selection and preparation of tools for data collection- questionnaire, interview, observation, measuring scales, ranking and measurement, reliability and validity of tools

UNIT-IV: CHILD/HUMAN DEVELOPMENT

- Principles of growth and development, care during pregnancy and prenatal and neonatal development.
- Theories of human development and behavior.
- Early childhood care and education – activities to promote holistic development.
- Influence of family, peers, school, community and culture on personality development.
- Children and persons with special needs, care and support, special education, prevention of disabilities, rehabilitation.

- Children at risk-child labour, street children, children of destitute, orphans, child abuse and trafficking.
- Adolescence and youth: changes, challenges and programs to promote optimal development.
- Adulthood, characteristics, changing roles and responsibilities in early and middle adulthood.
- Aging-physical and psychological changes and care needs.
- Research methods-types of variables and their selection.

FAMILY STUDIES

- Dynamics of marriage and family relationships.
- Family welfare-approaches, programmes and challenges, role in national development.
- Domestic violence, marital disharmony, conflict, resolution of conflict.
- Parent education, positive parenting, community education.
- Family disorganization, single parent families.
- Family studies-family in crisis, family therapy, initiatives for child development.
- Human rights, rights of children, rights of women, status of women, gender roles.
- Guidance and counseling- across life span and for care givers.
- Health and well being across life span development.
- Research methods- data collection and classification, coding, tabulation, inferential and descriptive statistics.

UNIT- V: COMMUNICATION FOR DEVELOPMENT

- Basics of communication- nature, characteristics, functions, process, models, elements, principles, barriers, perception, persuasion and empathy, types of communication, levels (settings) of communication transactions, process of listening.
- Communication systems and communication theories- human interaction theories, mass communication theories, message design theories, communication systems, culture and communication.
- Concept of development- theories, models, measurement and indicators of development.
- Concept of development- communication models and approaches, diffusion and innovation, mass media, social marketing.
- Role of communication in development- need and importance, development journalism, writing for development-print, radio, television and internet.
- Concerns of development communication- gender, health, environment, sustainability, human rights, population, literacy, rural and tribal development.
- Advocacy and behaviorchange communication- concept, theories, models, approaches, application and challenges.
- Traditional, modern and new media for development - folk forms of songs, art, dance, theatre, puppetry, advertisement, cinema, ICTs for development-community radio, participatory video, social media and mobile phones.
- Organisation/agencies/institutes working for development communication- international/national/state and local.
- Research methods-analysis of data through parametric and non parametric tests.

EXTENSION MANAGEMENT AND COMMUNITY DEVELOPMENT

- Historical perspectives of extension–genesis of extension education and extension systems in India and other countries, objectives of extension education and extension service, philosophy and principles of extension programme development.
- Programme management- need assessment, situation analysis, planning, organization, implementation, monitoring and evaluation.
- Extension methods and materials- interpersonal, small and large group methods, audiovisual aids-need, importance, planning, classification, preparation and field testing, use and evaluation of audio-visual materials.
- Curriculum development and planning for extension education and development activities, Bloom's taxonomy of educational objectives and learning.
- Non-Formal, adult and lifelong education-historical perspectives, concept, theories, approaches, scope, methods and materials used, challenges of implementation and evaluation, issues to be addressed.
- Training, skill development and capacity building for human resource development- methods of training, entrepreneurship development.
- Community development- perspectives, approaches, community organization, leadership, support structures for community development, Panchyati raj institutions, NGOs and community based organisations.
- People's participation and stakeholders' perspectives, Participatory Learning and Action-methods and techniques.
- Development programmes in India for urban, rural and tribal population groups- programmes for nutrition, health, education, wage and self employment, women's development, skill development, sanitation and infrastructure.
- Research methods-scientific report writing, presentation of data, interpretation and discussion.

A. KARTHIK

Principal Secretary to Government.